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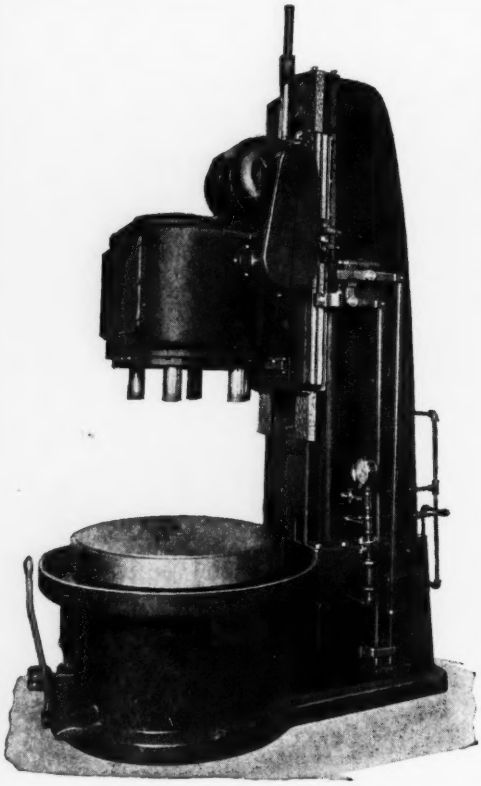

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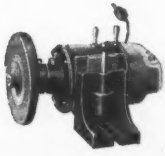

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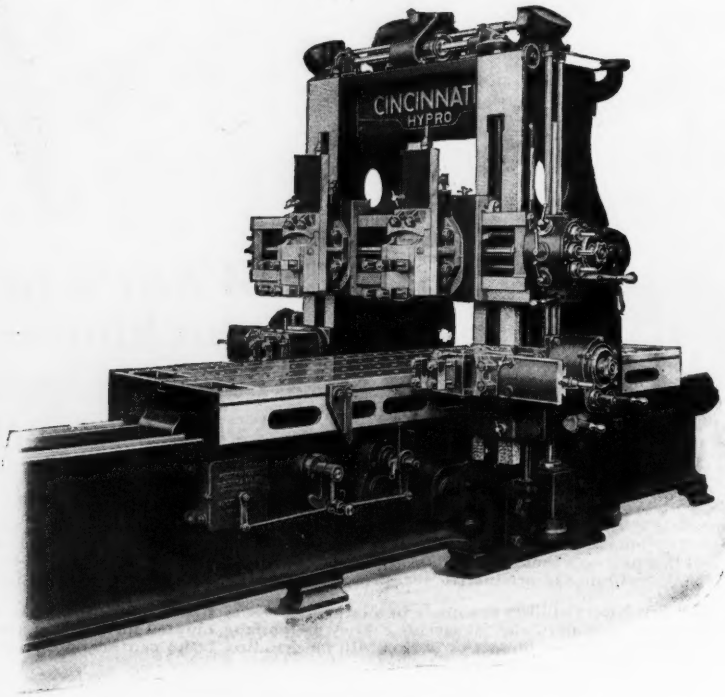

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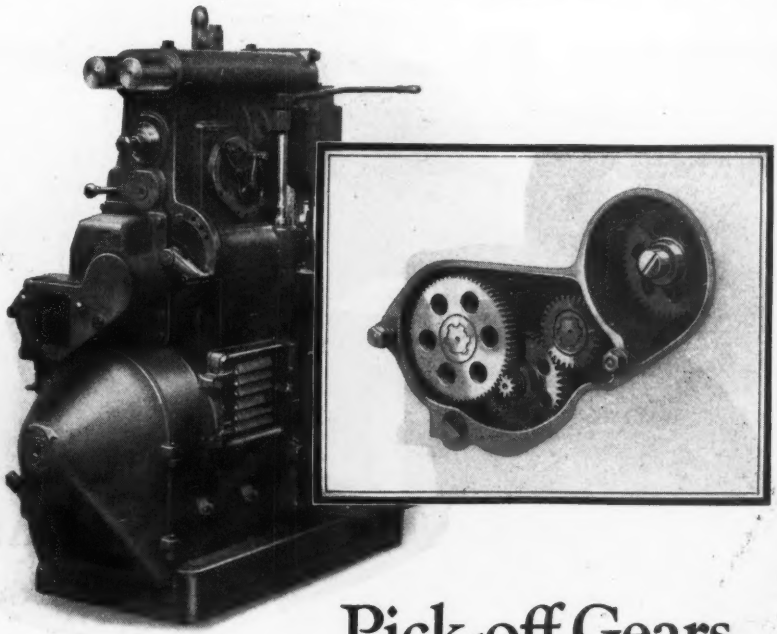

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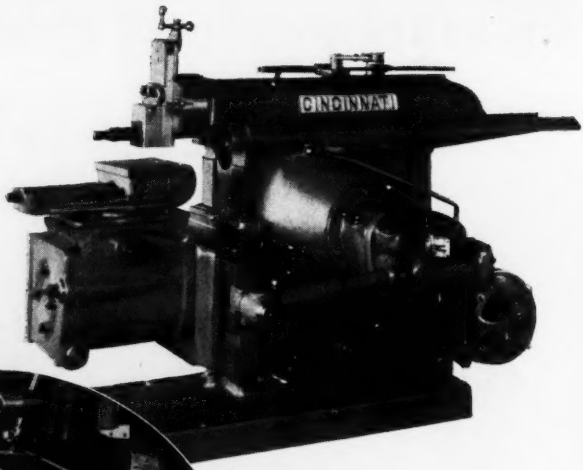

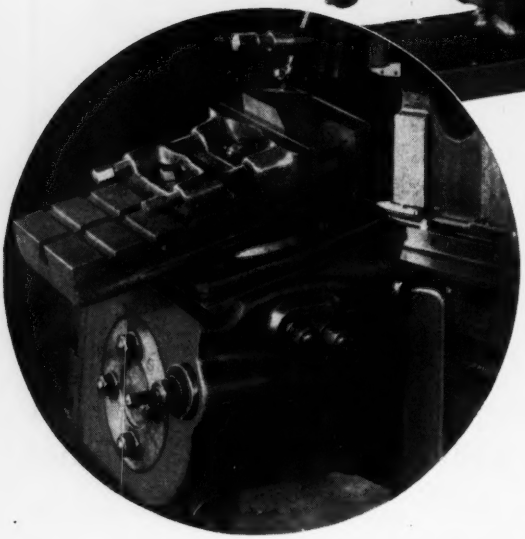

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Vol. 1 NOVEMBER, 1928 No. 6

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MODERN
Machine Shop

NOVEMBER, 1928

CINCINNATI, OHIO

VOL. 1, NO. 6

L. & N. Shop "Kinks"

By HOWARD CAMPBELL

WHILE the Louisville & Nashville Railway shops at Covington, Ky., are not as large as some of the other shops of that system, a number of special tools have been developed there that could be used to advantage in other shops. Among such tools are the fixtures shown in Figures 1 and 2. Figure 1 shows a combination driving box brass and hub plate attachment, set up for the first machining operation, which consists of facing the hub plate. The piece is located against the vertical surface of an angle plate that is bolted to the table of a boring mill, as shown, and is held in position by set screws in three small angles.

The next operation consists of clamping the piece to the table by means of a couple of ordinary clamps and facing the opposite end to length. Then a jig is bolted to the machine table and the brass is turned and the hub plate is faced in one operation, as shown in Fig. 2. The tool is of Rex AA, forged and ground so that it can be used to perform both the turning and facing operations. The

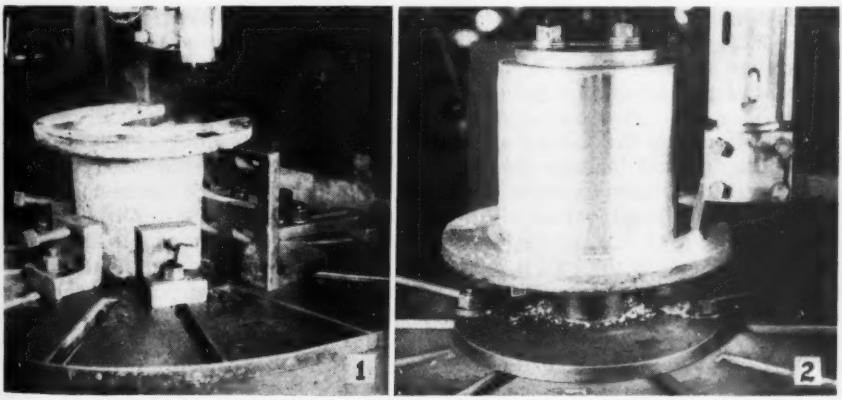
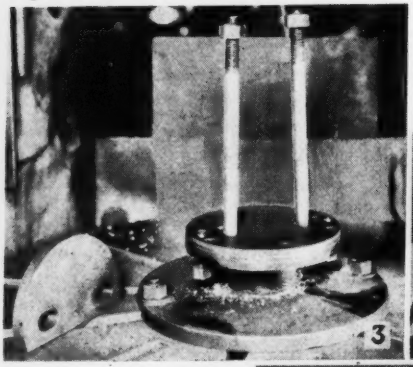
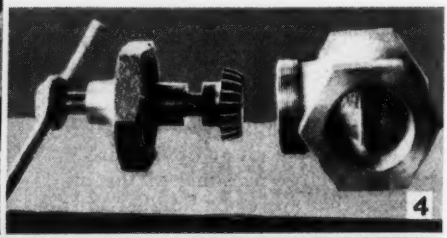


Fig. 1—Driving box brass set up for first operation. Fig. 2—The piece is turned and faced with the same tool.

fixture, which can be seen in Fig. 3, consists mainly of two circular sections, one of which is bolted to the machine table, while the other serves as a base for the work. When in position, the piece is first locked with the clamping plate, which is held in place by the two long bolts, then two sharp-pointed set screws are screwed into the casting from beneath. These set screws hold the casting so firmly that a piece has never been known to break loose while in process of being machined.





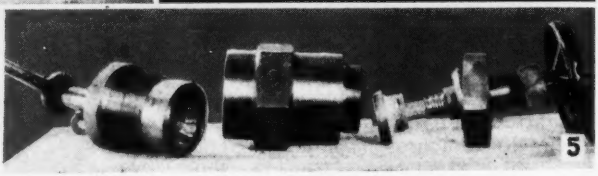
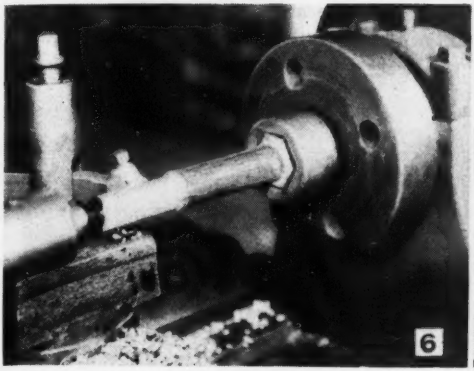


Fig. 3 — Jig for holding brass. Note the setscrews which keep the piece from slipping. Fig. 4—Tool for remachining seat in globe valve. Fig. 5 — Tools for remachining the disc of an injector valve.

Included among the tools that have been designed and built in this shop are several for reclaiming worn valves. Fig. 4 shows a globe valve, with the tool that is used to remachine the seat. The shank of the tool is held in a bearing which forms the axis of a hexagon cap. When screwed onto the valve with the cutter in place, the end of the bearing rides against the shoulder on the cutter. To operate, the valve body is clamped in a vise, then the tool is inserted and the cap is screwed down until the cutter is tight against the seat. Then, with the aid of a handle, the cutter is revolved until it has cut itself free, and if the seat is not perfectly smooth the cap is screwed down still further and the process is repeated. With such a tool, a seat is produced that is usually better than the seat on a new valve.

The tool used for returning the disc of an injector valve is shown in Fig. 5. At the left is the cutter and the threaded piece through which it operates; the center piece is the body of the tool, and at the right is the valve disc and handle, together with the nut that holds it in position. To operate, the valve disc is inserted into the body of the tool and the nut is screwed on, then the tool is inserted at the opposite end and the threaded piece is screwed in until the cutter blades are forced into the disc. With the tool held in a vise, the handle is turned and the tool is fed in at intervals until a good seat has been cut on the disc. The blades in this cutter are of carbon steel, and are formed, hardened and ground to shape before being put into the tool.

An ingenious device which is both a safety measure and a time saver is



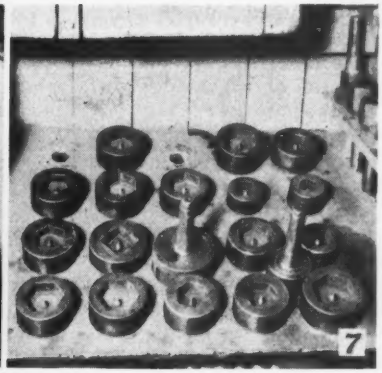


Fig. 6—Driving work without a dog. Fig. 7—Bolt-drivers. The piece swings between centers, and the hex or square does the driving. Fig. 8—Tool for driving the threaded end of a stud.

shown in Fig. 6. This tool is a bolt driver, consisting of a round piece with a taper shank that fits into the spindle of the lathe, and having a hexagon-shaped cavity in the other end which is deep enough so that the head of a bolt can be inserted as shown. A center in the bottom of the cavity provides for swinging the piece on centers, while the "hex" does the driving. This driver eliminates the use of a dog, which not only saves the time of attaching and removing the dog, but also precludes the possibility of a sleeve being caught on the dog set screw. There is a different size of driver for each kind and type of bolt that is made in quantities, several of which are shown in Fig. 7. These are considered as machine equipment, and as such are kept at the machine instead of in the tool room.

Another handy lathe tool is the stud driver shown in Fig. 8. This tool resembles a collect, having two jaws that are forced together by the action of a collar with an internal taper. The body of the tool consists mainly of a taper shank that fits into the machine spindle, a thread being provided for the collar. Before the piece was slotted to form the jaws, an internal thread was cut to fit the thread of a stud. When in use, the collar remains on the tool. When ready to perform the second threading operation on a stud, the threaded end is screwed into the collect, where it is locked with a turn of the collar, then the tail center is screwed into the turned end and the threading proceeds. The main feature of this tool is not only that it eliminates the use of the dog, with its attendant danger, but it also saves the thread from being damaged by a set screw.

One of the most interesting tools in the shop is the portable milling machine, shown in Fig. 9. When a locomotive comes in with the shoe and wedge jaws badly worn, they are built up by the electric welding process. The welded section has a rough, corrugated surface, however, which must

be machined smooth before the parts can be assembled to the engine again. This task is easily accomplished with the aid of the tool shown, which is clamped to the side of the engine frame, the cutter adjusted for the required depth of cut, and an air motor attached to supply the power. The larger part of the machine consists of a housing that carries the feed screw, and which is machined true on the open side to provide a bed for the tool housing to travel on. The cutter is of the inserted-tooth type, and is carried on a spindle that can be adjusted by means of lock nuts at the ends of the bearings. The tool is fed across the work by hand, as shown, but the main body of the tool can be reversed and the feed handle used at either end of the screw, so that the tool can be used in any position. A welded jaw can be machined in from thirty minutes to an hour with this outfit.

In accordance with the practice of doing everything, as far as possible, with the aid of power, cylinder heads are ground-in to the cylinders with the aid of the device shown in Fig. 10. An air pump cylinder has been bolted to a small platform truck in such a manner that it can be stood on end, as shown, when in use. To the piston rod is attached a bar that is bolted to the cylinder head, as shown, the head being held in position by a section of heavy tubing that is a slip fit on a round bar. Pressure is obtained against the head by means of a heavy coil spring that is located at the rear end of the tubing, where it is held in place by a pin that is inserted through a hole in the bar. When the air is applied, the piston operates up and down for a distance of approximately ten inches, revolving the head with each movement. A toggle joint between the piston rod and the bar provides for swing due to the radial movement of the bar. The use of this outfit eliminates a lot of hard work, and a steam-tight joint can be produced without difficulty.

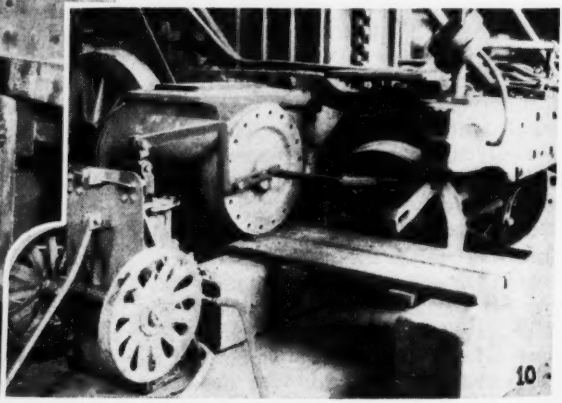


Fig. 9—Portable milling machine, used to remachine welds on the frame. Fig. 10—Grinding-in a cylinder head with the aid of an old air-pump.

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WIZARD Quick-Change Chucks

Intangible Effort Earns Salary Dividend

By PHILIP WINTER

J. B. Green, president of the Chicago Steel & Wire Company, has perfected a salary-dividend system for executives which avoids many of the evils of other systems. This plan recognizes the capital status of organization good-will, and pays a salary-dividend to the men who create it.

THE dream of every executive who has been such for any length of time is the perfect organization—an organization of department heads who are thoroughly capable in the handling of their respective departments, and who take a real and personal interest in the growth and welfare of the company. He visualizes his group of employees as a "happy family"—each taking as much interest in the welfare of the company as though he were one of the owners. Obviously, each of these men is there for the same purpose that the company is there—to make as much money as possible—and when one is drawing a predetermined amount of salary at regular intervals, it is human nature to exert one's self only enough to earn this salary. This being the case, nearly every manager sooner or later reaches a stage in his career where he begins to consider the possibilities of a "bonus" or "profit-sharing" system.

Most of these plans are developed from blind "hunches" or are based on the apparent success of some other system. Many of such systems are called "profit-sharing plans," but analysis will reveal a gap of some sort in the tie-up between the "share" and the effort of the recipient. In most cases he never knows what he is going to get, and usually carries a secret feeling that, regardless of what system is used to determine his share, he is kept in the dark so that if the share appears too large, it can be reduced without fear of a protest from the sharer. Thus the purpose of the system is defeated and the status quo is just about what it was before.

Few men can be stimulated today by the promise of future reward. The farther the reward is away from the effort, the less effort will be expended to earn that reward. Therefore in order to obtain the best possible results, the recipient must know beforehand what the reward is to be, or upon what results his share is to be based. He then has before him the same goal that his employer has; a definite percentage of reward or returns depending on the success of the company.

Mr. J. B. Green, president of the Chicago Steel and Wire Company, has perfected a "salary-dividend" system which incorporates the above important feature and includes some others that were not so obvious. In the first place, an employee must have been with the company five years before he is eligible for the bonus list. During this time his ability to put forth what Mr. Green calls the "intangible effort" is noted, and it is upon this point that the decision to retain or discard him is based. The man who is only concerned with the actual duties of his job, with no con-

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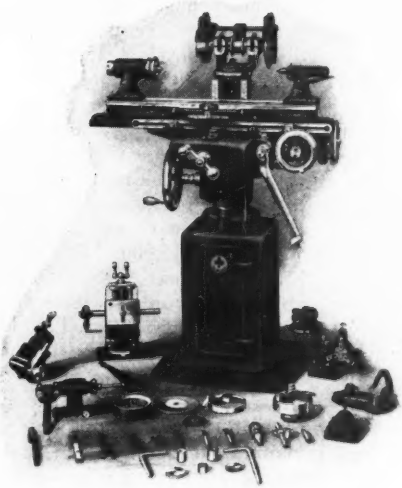

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cern for the success of the job next to him, or of his department as a whole is not putting forth this intangible effort, and therefore is not considered a good employee. Such an employee may see another workman doing something that he knows is entirely wrong, yet he will let the other proceed without making an attempt to advise him, just because he is hired to look after his own job—not the other fellow's. His attitude represents the difference between interest and apathy, and there is no room for apathetic employees in this plant. Such an employee will usually eliminate himself long before the five-year period is over. On the other hand, the employee who has put in five years with the company and has shown himself capable of the "intangible effort" has built up an interest in his work and in the company, and will probably stay with the company for life. In five years he has become an expert workman, has "hit his stride," and represents a valuable investment to the company. As such, he is part of an organization which, while not actually appraisable, is of considerable value to the company. The workman has also made an investment, in that he has given his time for five years to becoming expert in his work, and in perfecting himself in the company's ways and methods. Considered from this angle, he is entitled to begin, at some point in his career, drawing interest on his investment.

Investigation having proved that five years is a fair length of time in which to learn all the details of his trade, this length of time has been set as the period necessary to make an employee eligible for the salary dividend. He receives the dividend at the end of his sixth year, at the time when the stockholders receive their dividends, his share amounting to a definite percentage of his year's salary. The percentage of the salary dividend is the same as the percentage declared to the regular stockholders of the company. After his sixth year of service his salary dividend is based on the amount of his salary for each year over five, the amount being increased each year of service thereafter until the principal amounts to $15,000, at which point it remains stationary. For example, if the participant's salary is $3,000 per year, at the end of the sixth year he receives a dividend based on a capital stock of $3,000, at the regular rate of interest paid to the stockholders of the company that year. At the end of the seventh year he receives the interest on $6,000, eighth year, $9,000, and so on. At the end of his tenth year of service, his capital stock investment would amount to the total sum of his salary after his fifth year of service, which would be $15,000. If the dividend payable that year was based on 3 per cent, he would receive 3 per cent on $15,000, or $450. This amount of principal would remain stationary henceforth, although his dividend percentage would vary according to the earnings of the company. The effect of such a system is to make the employee feel that he is, in reality, a shareholder in the company, and as such he is as much interested in the welfare of the company as one of the officials or stockholders would be.

The system, if it may be called such, is merely a recognition of internal good-will, and the salary dividend is paid to those employees who have seen fit to invest in it. These dividends are declared by the board of directors in the same manner as the dividends payable to the men who have invested in the capital stock of the company. External good-will, which consists largely of the willingness of customers to co-operate with

(Continued on page 36)

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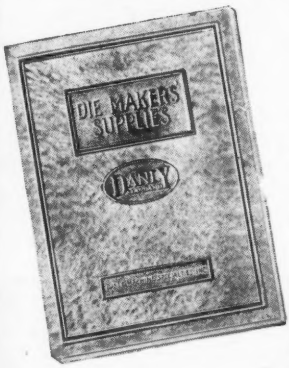

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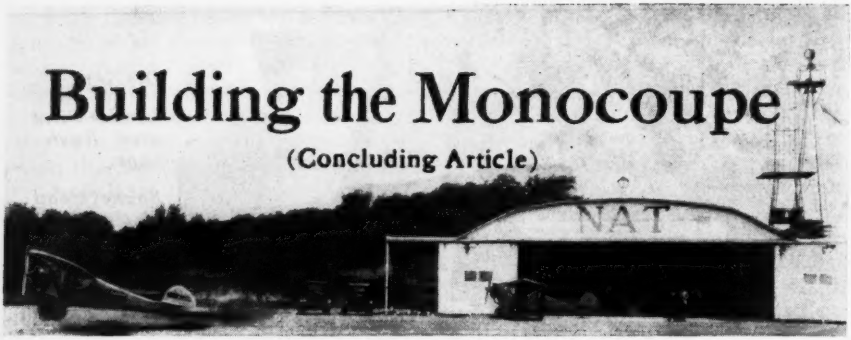
(Concluding Article)



By AVERY E. GRANVILLE

THE cam for the Velie five-cylinder aircraft engine is an alloy steel forging, designed as shown by the piece lying on the table of the machine in Fig. 12. After being heat treated and hardened, the cam is ground to size on this machine, with the aid of a cam-grinding attachment. A master cam in the attachment rocks the arbor back and forth so that the cam is ground to the exact shape required, within .002 inch of the drawing dimensions.

In the first machining operation on the crankcase, which is of Lynite, the case is chucked in the heavy duty LeBlond lathe shown in Fig. 13 and the rear end is faced and bored. In the second operation the case is located on a pilot that is bolted to the faceplate and the front end is machined. When assembled in the gear case cover, which covers the rear, it carries the magneto, oil pump, and tachometer drive. The nose or front section carries a deep groove ball bearing which transmits the thrust of the propeller from

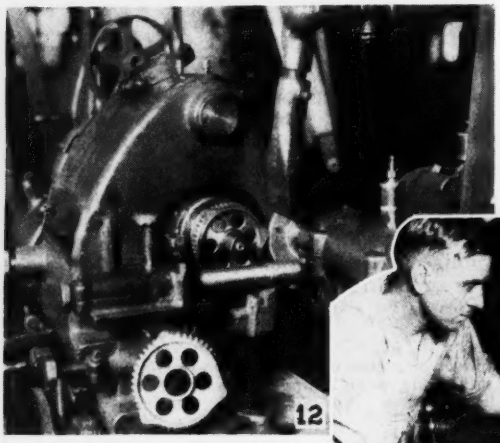


Fig. 12—Grinding cam for Velie Aircraft Engine. Fig. 13—Boring and facing rear end of crankcase.

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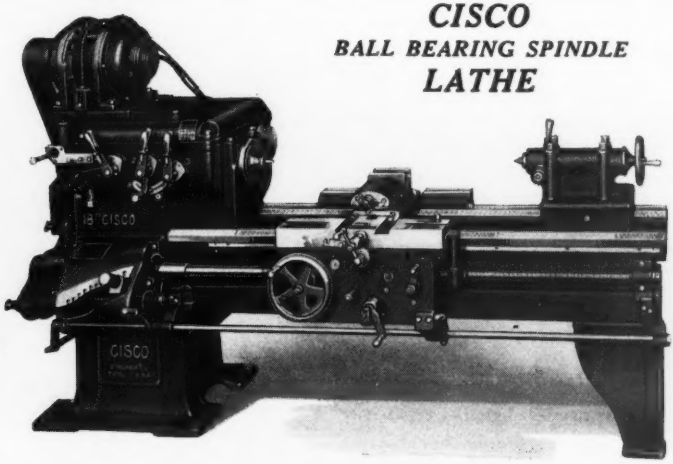

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The CISCO Lathe, with the spindle mounted on Special Ground Precision Ball Bearings, saves time, power, space and investment.

SAVES TIME, because it takes heavier cuts, removing more metal in a given time.

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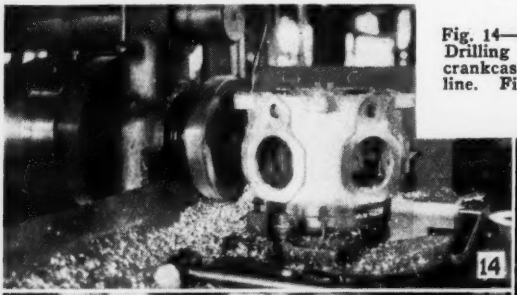
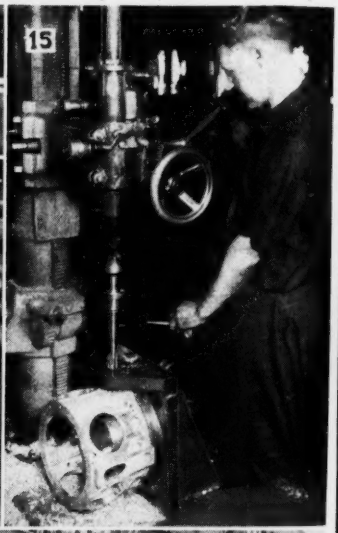
the shaft to the engine mounting by way of the crankcase.

The next operation on the crankcase is that of milling the faces, which is done on a LeBlond No. 3 milling machine, using a 10-inch cutter as shown in Fig. 14. A special indexing fixture is used, and the piece is held to a limit of .005 inch from center. The case then goes to the drill press shown in Fig. 15, where the valve guide holes are drilled and reamed. Here again the case is located on an indexing fixture, a rose reamer being used to finish the holes.

The motors are assembled by the progressive system, each motor being held in a portable stand as shown in Fig. 16. The top section of the stand swivels so that the motor can be swung around; and the legs rest on





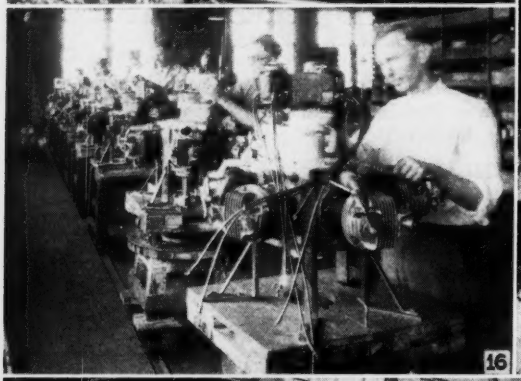


Fig. 14—Milling faces of crankcases. Fig. 15—Drilling and reaming valve guide holes in crankcases. Fig. 16—View of motor assembly line. Fig. 17—The motors are tested in individual test-rooms.

Cotton Gin Manufacturer Reduces Pin Reaming Cost 44.2%

4 "Spirex" Machine Taper Pin Reamers now do the work of 48 standard taper pin reamers —and breakage is eliminated!

Job consists of reaming five pin holes through ends of ¾-inch steel shafts set in cast-iron journals from ⅜ to 1-inch in radial thickness. Total reamed length from 2¼ to 2⅝ inches. High Speed "Spirex" Machine Taper Pin Reamer, List No. 650, Size No. 3, is used. Average reamer life about 875 holes. Operator reports frequent stalling of drill, but no reamer breakage.

Above is given a brief summary of the performance of a "Spirex" Machine Taper Pin Reamer in the plant of a cotton gin manufacturer.

Complete details are contained in DIGEST No. 51.

We shall be glad to send you a copy upon request

MANY a manufacturing plant, now doing one or more pin reaming jobs with the old-style pin reamers, should be interested in this performance story of "Spirex" Machine Taper Pin Reamers.

In the Assembly and Finishing Department of a cotton gin manufacturer the job shown in the illustrations below was being done with straight fluted taper pin reamers by HAND. Five holes in each gin were pin reamed—in the hands of a skilled workman—in from 10 to 12 minutes. Despite all precautions reamer flutes chipped badly and breakage was frequent. An average year's work of 3,500 holes required at least 48 reamers, with a total tool, machine and labor cost of $89.05.

When "Spirex" Machine Taper Pin Reamers were introduced an ordinary, unskilled assembler, with a portable electric drill, was able to pin ream the five holes in 5 minutes, chipping and breakage were entirely eliminated, and FOUR "Spirex" Reamers were used for an entire year's output of 3,500 holes—at a total cost of $49.67.

On this one job, therefore, "Spirex" effected a saving of $39.38, or a cost reduction of 44.2%—more than three and one-half times the entire reamer cost!

To be sure, the amounts involved are not large—in this particular case—but a troublesome, annoying job was made easier and smoother through the discovery of the *right* pin reamer.

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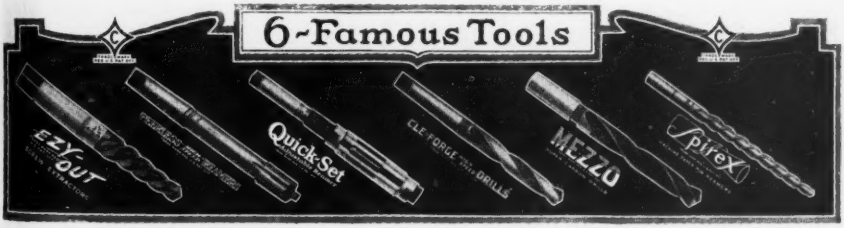
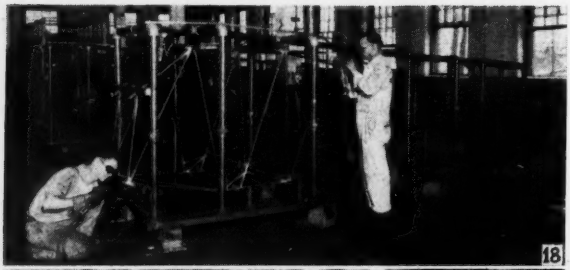
Manufacturers of Carbon and Cle-Forge High Speed Drills for every purpose; "Mezzo" Super-Carbon Drills; Hand, Jobbers' and Shell Reamers; "Peerless" High Speed Reamers; "Paradox" Adjustable Reamers; "Quick-Set" Reamers; "Spirex" Machine Taper Pin Reamers; Chucking Reamers for Turret Lathes; Counterbores; Countersinks; Sockets; End Mills; and the "Ezy-Out" Screw Extractor.





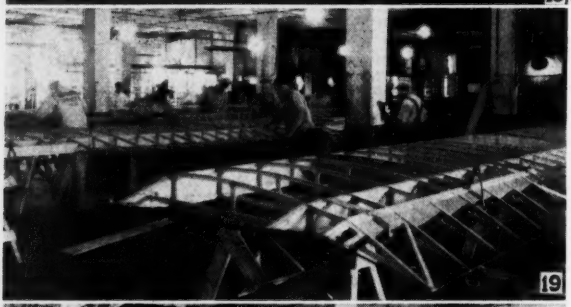


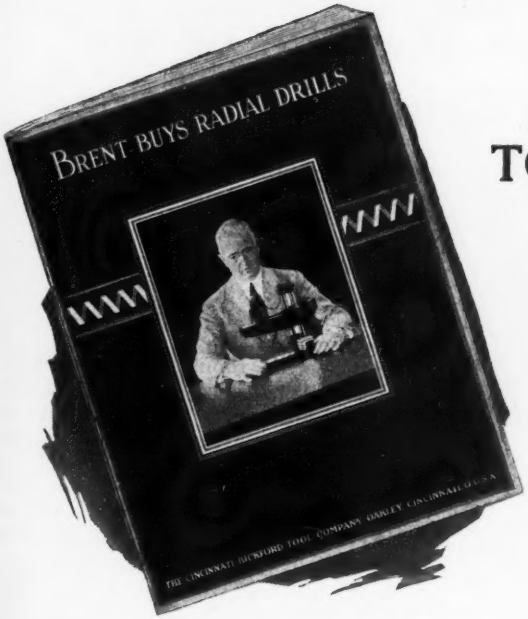
Fig. 18—Building the fuselage. The sections of steel tubing are clamped in position in this jig, then they are welded together. Fig. 19—Making the wings. Each piece of wood is individually examined and tested before being used. Fig. 20—Final assembly. Here the finishing touches are given the Monocoupe.

wheels that are guided by a steel track. When the motor leaves the end of the line, it is ready for testing. Each motor gets an individual test in one of the test stands shown in Fig. 17, where all the conditions under which it may have to operate are reproduced.

The fuselage is mostly of 20 gauge (.035) steel tubing, welded at the joints. In order to obtain the necessary accuracy and at the same time reduce the operation of building the fuselage to its simplest terms, jigs similar to the one shown in Fig. 18 are used to locate and hold the sections of tubing for welding. When in place, each section is clamped in the exact position it is intended to occupy, and it is only necessary for the welders to weld the joints to complete the unit. When completed, the two cross members at the front of the jig are removed and the fuselage is pulled out. It is then carefully inspected and every joint is tested before the unit is allowed to leave the department.

A view of the wing department is shown in Fig. 19. The wing is made in one unit with a span of 30 feet and a width, straight across from edged to edge, of five feet. The spars are of selected airplane spruce, routed I-beam section, and the ribs are constructed of 1/8-inch basswood webs, with spruce capstrips, large rectangular openings being cut in the webs to lighten the plane. The wing covering is of special airplane wing linen, known as "Flightex Grade A," stitched to the ribs.

The final assembly department is shown in Fig. 20. Here the motor, propeller, and other parts are added and when the plane leaves this department, it is ready for the air.



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Pointers on the Use of the Cylindrical Grinding Machine

DURING more than half a century of development in cylindrical grinding, truths governing the design and use of cylindrical grinding machines and grinding wheels have been discovered which indicate that the machines and wheels can be—and that the best machines and wheels are—designed in harmony with scientific laws, but that the successful use of them is more an art than a science. The following rules, based upon experience, will prove a safe guide to the most efficient use of cylindrical grinding machines.

Speed of Traverse—Width of Wheel

The narrower the face of the wheel, the slower the traverse should be and the faster the work revolution. The wider the face of the wheel, the faster should the work be traversed, and the work revolution should be adjusted to feed nearly the width of the wheel. These rules apply both when roughing and when finishing. With the slowest work revolution and the fastest traverse consistent with the width of the wheel face, maximum production is obtained with a minimum of wheel wear and minimum of power consumed both when roughing and when finishing.

Grade of Wheel—Speed of Work

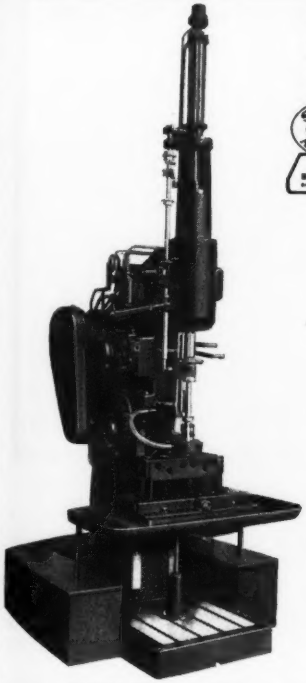
It is natural for most operators to suppose that the faster the work revolves, the greater will be the production. It is this supposition that leads them to use very hard wheels, requiring maximum power and causing maximum of wear on the machine. In most cases the work thus produced is of inferior quality, and the operation requires a longer time and greater effort on the part of the operator and machine than if softer wheels and slower work speeds are used.

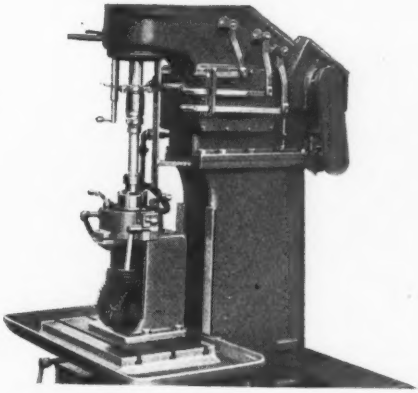
There is a limit to the amount of power that can be supplied to any machine, regardless of its weight and the size of its belts and pulleys. If an operator should continue to increase the speed of the work indefinitely, making necessary the use of harder and harder wheels and thus continually increasing the necessity for more power, eventually the point would be reached where sufficient power could not be supplied. The belt would then slip, giving an irregular speed to the wheel and causing the face to fill, which in turn would cause still greater resistance. This would soon result in the destruction of the machine itself.

Depth of Cut—Speed of Work—Grade of Wheel

The work speed for a given piece of work cannot be mathematically predetermined, because of variations in material and grinding wheels. The proper work speed depends on so many variables that consideration should be given only to its effect upon the cutting action of the wheel. An understanding of this principle will enable an operator to adapt a given wheel to a variety of work.

When turning in the lathe, the larger the work, the slower must be the surface speed, because the cutting speed, or speed at which the surface of the work passes the point of the tool, must remain nearly constant; when grinding, the work surface speed must be increased if the size of the work is increased, and vice versa





Close-up of No. 249 Honer with hinged fixture for honing airplane cylinder.

Self-Oiling All-Geared *Cylinder Honing*

FINISHING internal cylindrical surfaces by honing is a vast improvement in method and result. The honed cylinder is exactly the same diameter from end to end, perfectly round and parallel; free from high or low spots, chatter marks and "fuzz." The close grained hard finish is smooth as glass and it cuts the time two-thirds when "running in" is required.

Self-Oiling All-Geared honing has replaced other methods of finishing holes, has *multiplied* production, decreased costs, lowered machine investment and saved floor space.

The No. 249 Self-Oiling All-Geared Honing Machine with Oilgear Control wonderfully improves the quality of the finish. It is a single spindle machine for honing separate cylinders or multiple-cylinder blocks progressively. No. 214 is a multiple-spindle machine for honing two or more cylinders simultaneously. Cylinders to 14" diameter and 19" long can be honed on standard machines and larger sizes by special arrangement.

Other Self-Oiling All-Geared machines and attachments for drilling, boring, tapping, reaming, countersinking, counterboring, facing and other operations described in catalog.

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The work speed must also be decreased as the wheel wears smaller. Therefore the grinding machine is provided with several work speeds, not because the machine is to grind various diameters of work, but because of the necessity of changing the work surface speed, owing to:

1. Variations in the grades of the wheels.
2. Variations in the hardness of the material being ground.
3. Differences in depth of cut.
4. Differences in production as governed by time.
5. Variations of surface speed and arc of contact of wheel, caused by wheel wear.
6. Necessity of securing different conditions of finish on work surface.

The following rules apply in general for efficient production:

The harder the material is, the softer the wheel should be, or the faster the work speed, or both.

The softer the material is, the harder the wheel should be, or the slower the work speed, or both.

The larger the work, the softer the wheel should be, or the faster the work speed, or both.

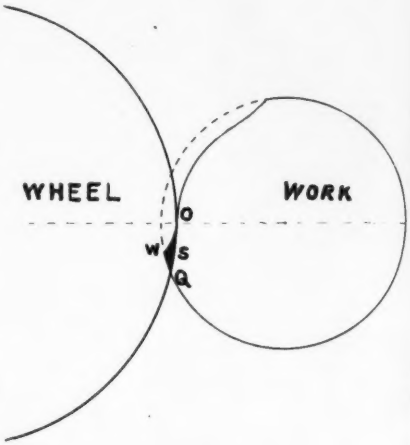
The smaller the work, the harder the wheel should be, or the slower the work speed, or both.

The slower the work speed and the softer the wheel, the deeper the cut may be. With this combination the maximum amount of metal is removed in a minimum of time, with a minimum loss of wheel and a minimum consumption of power.

The larger the work, the longer the arc of contact is between the work and the wheel. To counteract the effect of the longer arc, the surface speed of the work must be increased. The cutting action of the wheel can largely be controlled by the work speeds, but to obtain the best results, the effect of work speed upon the cutting action of the wheel should be fully understood.

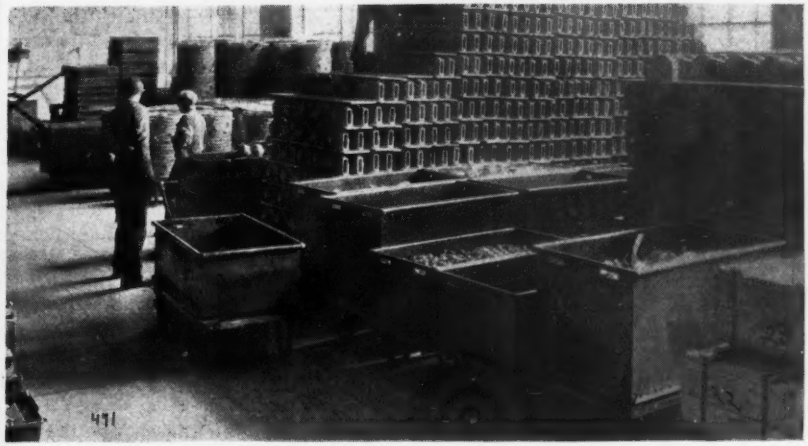
Cutting Action of Wheel

Referring to the drawing, let us assume that there is but one abrasive grain or cutting point in the surface of the wheel, and that this grain is at **O**. As the wheel revolves, the point **O**



will move to **Q**, but at the same time the revolution of the work is carrying the point **Q** around to **W**. As the speed of the work is usually very much less than the speed of the wheel, this distance **QW** will be much less than **OQ**. During this action, the cutting point is removing a chip, represented by **OQW**. From the outline or shape of the chip, it can be seen that when the cutting point starts cutting at **O**, the depth of cut is nothing, but as the wheel and work continue to revolve, the depth of cut increases to its maximum, indicated by **WS**, and then again decreases to the vanishing point. The dimension **WS** is called the "grain depth of cut."

We have been considering the grinding wheel as having one grain, or cutting point; actually a wheel is seldom used that has less than 50,000 points.



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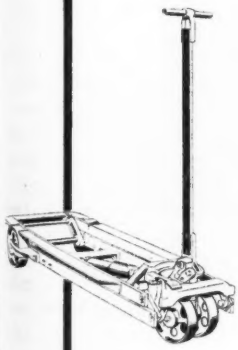

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and often it has from 500,000 to 800,000 points. The number of chips removed per minute by the grains of a grinding wheel runs into the millions. Therefore, as there are a number of cutting points between **O** and **Q**, the grain depth of cut of each point will be the dimensions **WS** divided by the number of cutting points in action at once, or the number between **O** and **Q**.

Artificial grinding wheels are composed of two constituent parts; (1) abrasive grain, which is a hard substance reduced to particles of various sizes, and (2) the bond, which is a material that is mixed with the abrasive grains and hardened by heat or pressure, or both, to hold the mass together in the desired form and shape. For proper wheel action, the bond should be soft enough to permit of wearing away at a rate that will allow the grains to be broken off and torn out just as they become dull, thus keeping fresh, sharp grains cutting at all times.

When a grinding wheel is working properly, the abrasive grain in the wheel may be considered as cutting small chips from the work, and the surface of the work as cutting or wearing away the bond of the wheel. It is quite evident that the greater the grain depth of cut, the more effective will be the action of the work upon the bond. As long as the bond is being worn down, the wheel will continue to work well. If the bond is cut away too rapidly, the wheel will appear to be too soft, and will wear away too rapidly. If the cutting points wear down faster than the bond is worn away, the face of the wheel will become glossy and the wheel will not cut freely. These considerations lead directly to the conclusion that the action of a given wheel upon a given kind of work is almost entirely dependent upon the grain depth of cut. If the grain depth is too great, the wheel wears away too rapidly; if the grain depth is too small, the wheel may glaze. It is, therefore, important to know how the grain depth of cut may be regulated.

Effect of Changes in Diameter of Wheel or Work

A study of the drawing will show that, as the work and wheel are revolving simultaneously, the thickness of the chip, or the dimensions **WS** and **WQ**, is dependent upon the speed of the work. If the speed of the wheel remains constant and the speed of the work is increased, the thickness of the chip will be increased. If the work is revolved at a slower rate of speed, the thickness of the chip diminishes.

It can also be seen that, as the wheel wears down and becomes smaller, the arc of contact **OQ** becomes shorter and the thickness of the chip, **WS**, increases. Assuming that the radial depth (depth of wheel in work), work speed, and wheel speeds remain constant, the bond will wear away faster as the wheel wears smaller, and the smaller wheel will appear softer. To hold the grain depth of cut at the proper depth and maintain the same conditions that existed before the wheel wore down, the work speed should be decreased accordingly.

Following the same line of reasoning, it can easily be seen that if the work diameter is increased (all other factors remaining the same), a longer chip will be cut from the work and as the number or volume of chips remain constant for each unit of time, the thickness of the chips, or grain depth of cut, will be diminished accordingly. A proper increase in the work speed on the larger work will bring the grain depth of cut up to the proper dimension.

All of the above results, which have

(Continued on page 32)

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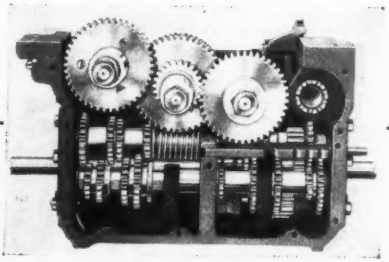

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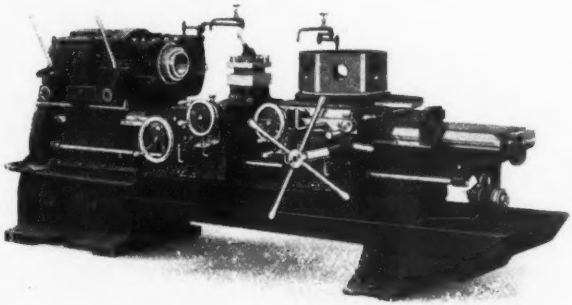


17″ and 4½″ Heavy Type Universal Turret Lathe.

THE ACME MACHINE TOOL COMPANY

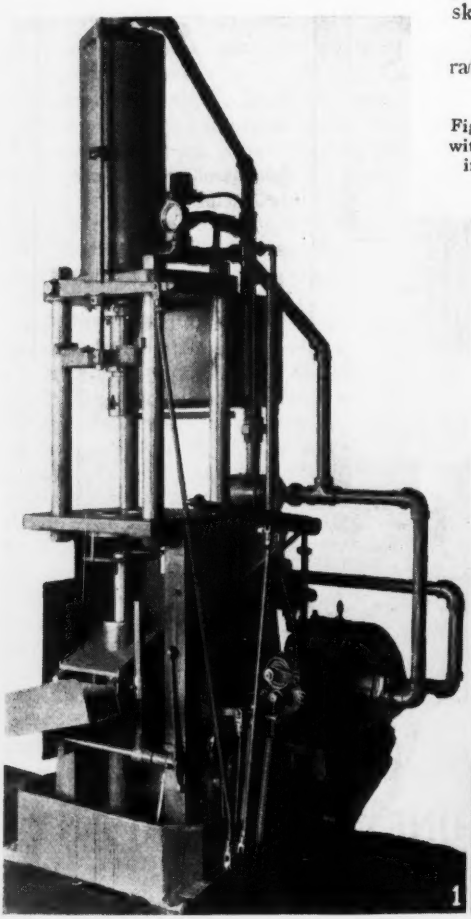
CINCINNATI, OHIO

Modern Broaching Operations

By DONALD A. CLARK

BEFORE the broaching machine was invented, square, rectangular, or irregular-shaped holes were machined with single point tools, cutting lengthwise of the hole. The broach was the development of an idea for finishing all sides of a hole simultaneously, and for following one cutter with another so as to save the time of returning the tool between cuts. And with such a tool, made to a given dimension, obviously nothing less than accurate work would be produced, while accuracy in the case of a single-point tool depended entirely on the skill of the operator.

The first broaching machine was a rather cumbersome affair, made to oper-



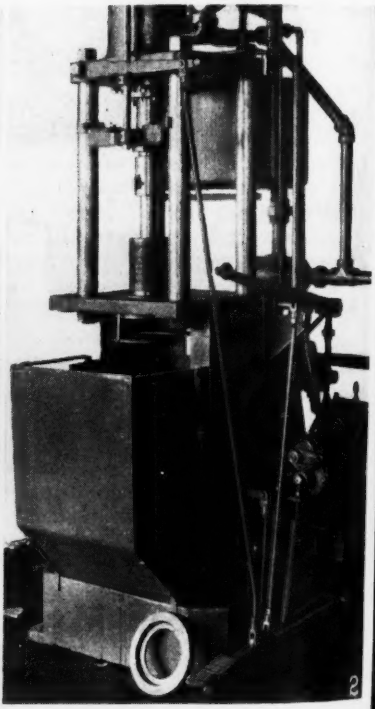
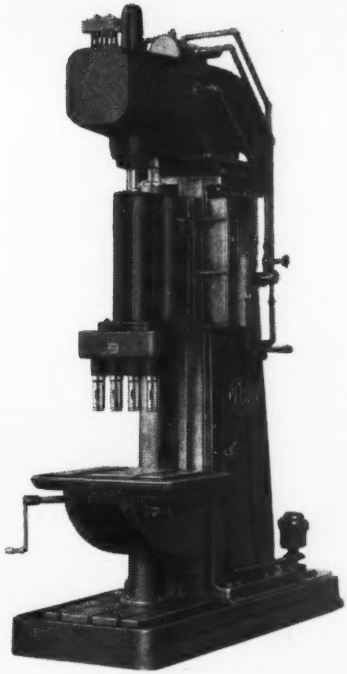


Fig. 1—Vertical hydraulic broaching machine with broach at starting point. Fig. 2—Broach in upper position, after broaching ring gear.

(Photographs and data courtesy American Broach & Machine Company)



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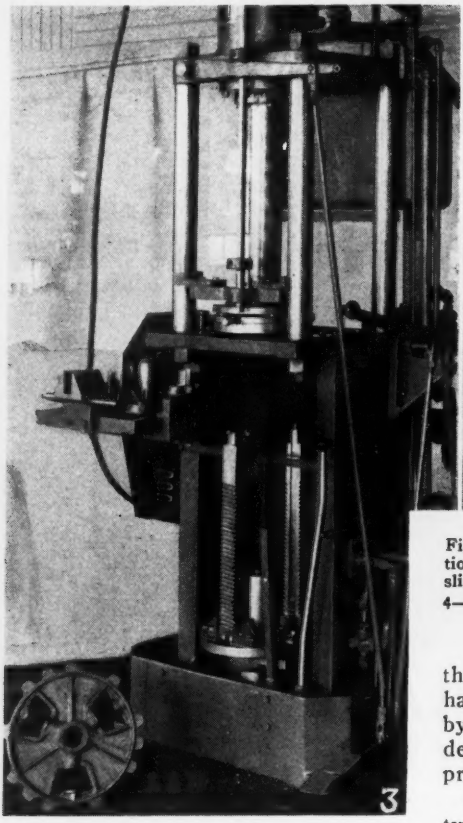

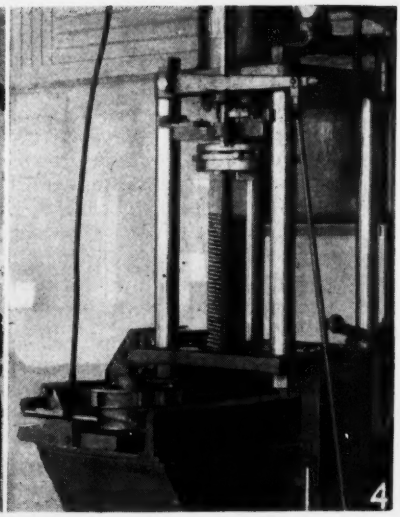

Fig. 3—Machine with three broaches in position to broach differential pinion carrier. Note sliding fixture pulled out to receive work. Fig. 4—Broaches in upper position and fixture pulled out so that work can be removed.

ate at a cutting speed of approximately three feet per minute. The more modern types of broaching machines are convenient to operate and, although the speed at which the machine is run depends largely upon the job, the many improvements in the design of the machine have made it possible to increase the cutting speed several times.

In comparison with the older types of broaching machines, which were horizontal, the trend in broaching machine design has been toward the vertical type, both as a measure of economy in floor space, and to centralize the controls. The square thread screw has been superseded, to a large extent, by the more flexible hydraulic cylinder, or by the ram of a vertical power press.

A broaching machine of the modern type is shown in Figs. 1 and 2. This machine is of the vertical, semi-automatic pull type, operated by hydraulic power. The tool can be seen underneath the table, ready to receive the work. The operation consists of broaching the large hole in the ring gear shown leaning against the column of the machine in Fig. 2. To operate, the gear is slipped over the upper end of the broach, then one of the foot pedals is pressed, thus starting the mechanism of a hydraulic cylinder underneath the broach holder, which raises the broach to the starting position. At this point the gear locates against the underside of the

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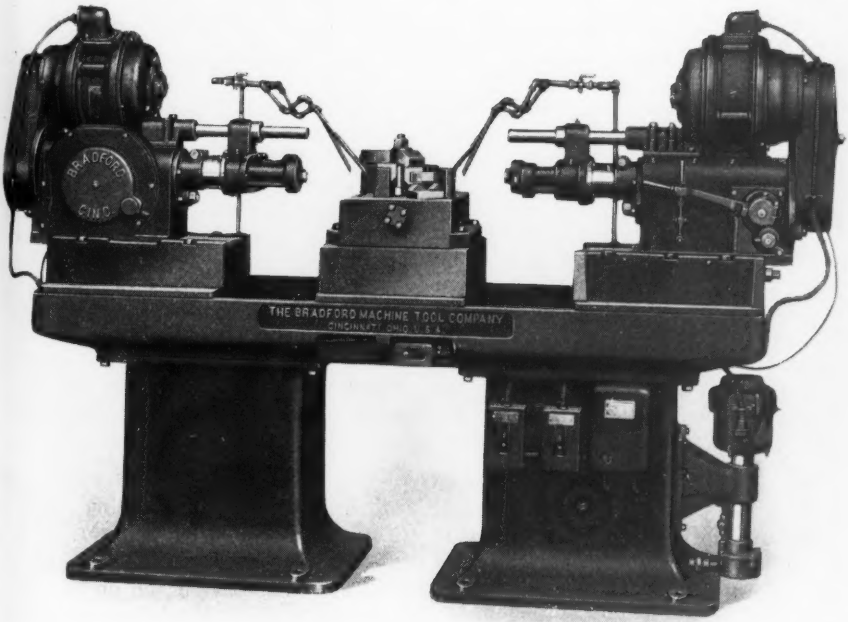

The above two-head machine drills two 5/16″ oil holes 6″ deep in forged steel crankshaft, half way through from both sides, simultaneously in 1¼ minutes.

Bradford "Unimatic" made up with any number of spindles for drilling or tapping or in combination for any particular job. Send us your blue prints or samples for production estimates.

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machine table, and the broach automatically connects with the pulling head. Now the second foot pedal is pressed, starting the mechanism of the upper cylinder, which pulls the broach through the work to the position shown in Fig. 2. The entire operation is performed, floor to floor, in twelve seconds. The machine shown has a capacity of twenty tons, which is ample for all ordinary work, and is equipped with a direct-reading oil gauge. By broaching bevel gears in this manner, a perfectly round hole is obtained, accurate within .0005 inch, which factor is of prime importance in the production of accurate bevel ring gears.

A good example of the versatility of the machine is illustrated by the piece of work shown in Fig. 3. The casting, which is a differential pinion carrier, has three openings with a total of six faces that are to be machined at right angles to the center hole. The dimensions between the faces, between the openings, and between the openings and the hole must be accurate within close limits.

The work is located and held by the use of a sliding fixture just underneath the work table, a hardened stud being used to center the piece. This fixture is also provided with hardened guides for guiding the broaches, of which there are three, as shown. After the work has been placed on the fixture and the fixture has been slid to position under the table, one of the pedals is depressed slightly, which causes the hydraulic cylinder at the bottom of the machine to rise rapidly with the broaches. As the shanks of the three broaches pass through the openings in the casting, they automatically connect with the pulling head and then stop.

At this point the second foot pedal is pressed and the mechanism of the upper cylinder is put into operation, the ram moving upward and pulling the broaches through the work as it goes. When the operation is completed, the broaches stop in the position shown in Fig. 4. At this point the fixture is pulled out from under the work table and the piece is removed. The machine is then reversed by means of a hand lever at the right of the machine and the broaches automatically recede and replace themselves in the lower locating fixture on the lower cylinder. Approximately ⅛ inch of stock is removed from each surface, which amounts to approximately .005 inch per tooth. The time required for broaching the casting complete, floor to floor, is 12 seconds.

The tonnage required to perform the operation described above is approximately six tons. The direct reading gauge shows the pressure applied in pounds per square inch and also the gross tonnage, at all times. The machine is also equipped with automatic relief valves which are set for operating at a maximum of 1,000 pounds per square inch.

Pointers on Grinding

(Continued from page 26)

been obtained from purely theoretical considerations, are based on the principle that the successful working of a grinding wheel depends upon the securing of the correct grain depth of cut for that particular wheel on a specified kind of work. It is confidently believed that the theory based on the idea of grain depth of cut will always lead in the right direction, and that it gives two empirical rules for changes of work and wheel speeds, a rational basis, and affords the operator an opportunity to do by thought and reason what heretofore he has done by memory alone.

(From "Grinding Wheels, Machines, Methods," Published by Norton Company.)

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In this new machine is found the proper application of POWER and distribution of WEIGHT to permit rates of feed with wheels 12" or 15" wide usually possible only with wheels a fraction of these widths.

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Experiences in Machining High Carbon-High Chromium Steels

By R. H. KASPER

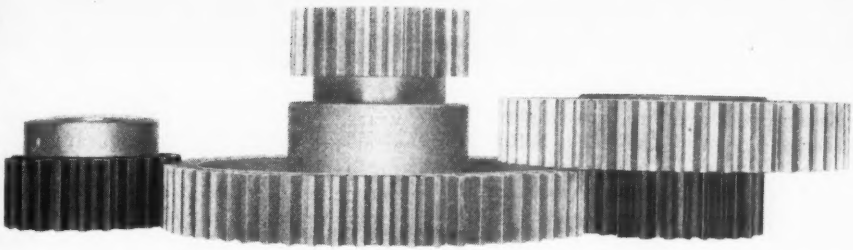
IN THE diemaking department of the shop with which the writer is connected, high carbon-high chromium steels were tested to determine their adaptability to certain classes of die work. The tests of the steels proved satisfactory, considerably longer runs from the dies being obtained. The impediment to the use of the steel was the difficulty of machining it, especially in securing a smooth finish on irregular shapes formed with a master tool, and in drilling and tapping. The steels tested contained from 2 to 2.5 per cent carbon, and from 12 to 14 per cent chromium. Experiments proved that there is a certain range of speeds and feeds for this class of steel which must be rigidly adhered to in certain operations; speeds and feeds which would ordinarily be used for machining straight carbon steels will not produce the required finish.

In experimenting on a shaper, a form tool producing a semi-circular outline of a 3/8-inch radius was used. The length of the cut was one inch and the shaper stroke was set to two inches. At the slowest speed, which was twelve strokes per minute, the tool would fail to cut for several strokes and then would dig in, tearing the steel and producing pronounced chatter marks. Though general practice would dictate a slower speed, the reverse was tried, the speed being increased until the ram operated at 150 strokes per minute. At this speed, the cut became smooth, though it was necessary to cut the feed of the tool down to .001 inch per stroke. With a coarser feed, the chips would cling to the cutting edge of the tool and cause tearing of the metal. Timing of the job showed that the volume of metal removal was practically the same as with slower speeds and heavier feeds.

Tests with various shapes of forming tools proved equally successful when these speeds and feeds were used. However, increasing the speed still further caused chattering and tearing of the steel in the same manner as the slower speeds. It was also found that if the feed was increased so as to curl a chip, tearing would invariably result; in all the tests, when the desired finish was obtained, the metal was removed in the form of very fine chips resembling filings.

It was found that there are two points which must be kept in mind if a smooth finish is to be obtained. First, the tool must not be permitted to drag over the work without cutting; a few passes of the tool over the work will be suffiicent to cause glazing, making it necessary to force the tool heavily into the work before it will start cutting again. Second, a lubricant must not be used; experiments with various types of cutting lubricants proved some to be better than others, but none gave as good results as were obtained by cutting dry, all of them showing a tendency to cause the tool to slip over the surface without cutting.

Lathe work was found subject to the same conditions. When facing work of large diameter, it was found necessary to change the speed as the



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tool approached the periphery of the work. This, of course, must be done without throwing out the feed; in other words, the large spindle must be stopped without throwing out the feed. To stop the feed before the spindle comes to rest would cause the tool to drag over the work without cutting, resulting in a glazed surface and making it difficult to again start the cut. The speed change must be made at the proper point, otherwise a pronounced difference in the finishes will be produced.

In drilling, the same conditions prevail; a high speed and a light feed will give best results. As soon as the drill shows signs of becoming dull, it must be sharpened, otherwise burning of the drill point will rapidly occur.

Tapping may best be done with series taps, which may be purchased in sets of three. Two of these taps are undersize, both at the root and land of the thread; a standard tap ground undersize will not give satisfaction, usually breaking in the hole. This is caused by the fact that the second tap will not follow in the path of the first, due to the flat formed by grinding off the lands of the tap.

These experiences are not offered as standard practice in machining high carbon-high chromium steels. They merely represent one shop's experiences, and are offered for what they are worth.

Intangible Effort Pays Dividends

(Continued from page 14)

the supplier by sending in orders, is quite generally recognized. Such good-will is the result of confidence based on experience. Internal good-will is much the same thing, taking the form of co-operation between the department heads and the employees. Time is required to develop internal good-will as well as external good-will. No one can accurately estimate the value of good-will in dollars and cents, but everyone will admit that it exists.

The system has been in effect two years. During the first six months after the system was inaugurated, the profits of the company increased 45 per cent over the same period of the previous year. Considering that the work in the Chicago Steel & Wire Company's plant is highly standardized, such a system should work even better in a jobbing shop, or where the work is of a diversified character. The construction and repair gang can be taken as an example of what has been accomplished. This gang originally consisted of seven men, and they appeared to be always behind with their work. The work is now being done by four men, and it appears that one of these can be transferred to other work in a short time. The most interesting feature is that the inauguration of the salary-dividend system has developed an organization spirit which did not exist before, and the practice of "buck-passing," with which every manager is familiar, has become a thing of the past in this plant.

The internal friction in a wire rope is of much more importance than the wear on the outside, but the application of oil or grease to the outside of the rope is of no use in lubricating the inside. To lubricate a wire rope properly, the rope should be immersed for several hours in hot oil. The oil should not contain any acid, but if it does, the acid can be neutralized by the addition of a small amount of slaked lime.

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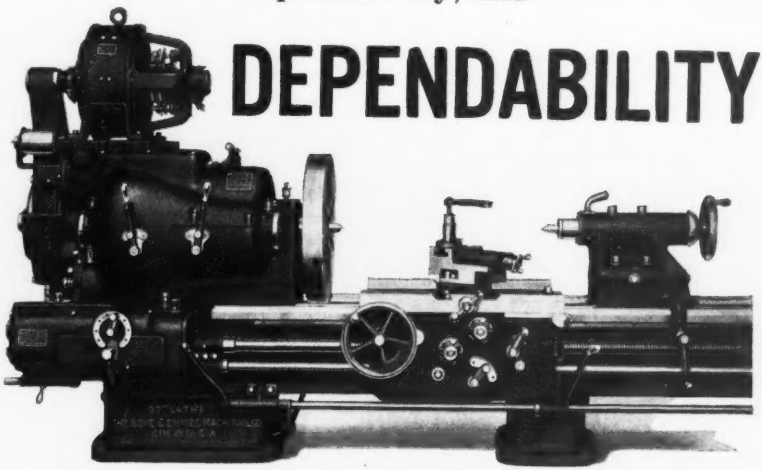

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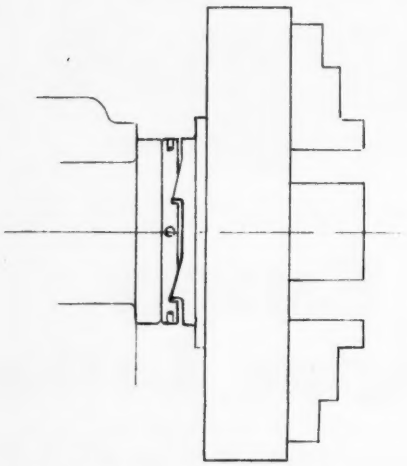
Ideas From Readers

This department is a clearing-house for ideas. If there is a "kink" or short-cut in use in your shop, send in a description of it. We will pay $5 for each one published.

A Chuck-Releasing "Kink"

By H. C. KLINE

WHEN a chuck sticks on the threads of a spindle nose, the common practice is to place a bar across the jaws and either pound on it or pull the belt backwards so that the bar will strike the bed of the machine. Another method that the writer has seen used is that of locking the spindle driving gears and pounding on the chuck until it is freed. These methods are harmful to both chuck and machine and can be eliminated by the use of the three-point friction device shown in the illustration.



Chuck with cams for releasing.

The device consists of two steel rings, the edge of one being machined so as to leave three projecting cams of gradual rise, equally spaced, the other having three corresponding cam faces. The latter ring also has four spanner-wrench holes drilled at equidistant points in the periphery. The first ring is fastened with screws to the back of the chuck and the other is slipped onto the spindle. The chuck is then threaded on until the two cam faces come together, the actual tightening taking place when the cam that is screwed to the chuck rides up on the cam that is loose on the spindle, there being enough friction between the shoulder of the spindle and the latter cam to keep the cam from turning. The resistance set up by the cutting tool serves to screw the chuck on tighter, and when it is sufficiently tight, the thrust set up between the cam faces and the threads on the spindle holds the chuck firmly in position.

To release the chuck, the spindle is held from turning while the loose steel ring is turned slightly with the spanner wrench, relieving the pressure between the cam faces. Even a tightly-jammed chuck can be easily released, and as soon as the thrust is removed the chuck will rotate freely on the spindle.

Repairing Damaged Cylinder Head Stud Holes

By "BACKWOODS MECHANIC"

IT IS not unusual, since the use of piston valves in steam locomotives has become general, to have cylinder head studs stripped from the cylinder

Stop drill breakage—

Increase production—
Reduce costs—

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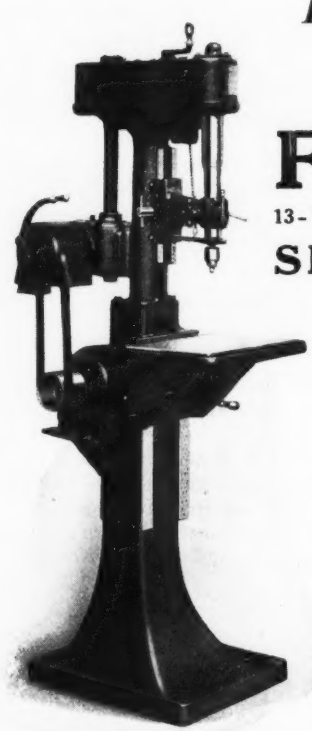
13-INCH SUPERSPEED BALL BEARING

SENSITIVE DRILL



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Speed Changes. The belt is shifted and speeds are changed by a single turn of the small handle on top. Belts can be replaced easily.

Balanced Spindle. The spindle is of high carbon steel, multiple splined, accurately ground, tested to do perfect alignment and running balance, and has adjustment to take up wear.

Counterbalanced Elevating Table. The elevating table is of the quick-acting counterbalanced type, with perfectly scraped slide gibbed to the pedestal. Handle at front of machine for clamping.

Counterbalanced Head. The head is gibbed to the doved-tailed slide on the column, and is counterbalanced to prevent dropping when unclamped.

Adjustable Feed Lever. The feed lever is adjustable to various positions for convenience of operation. A quick return star wheel enables the operator to feed, return, or position the drill rapidly with either hand.

If you are looking for ways and means to cut costs, ask for specifications and prices on this machine.

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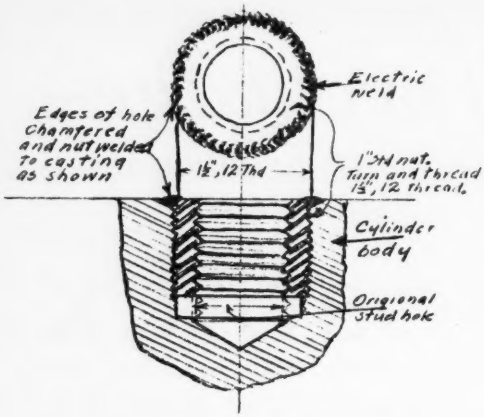

Electric weld
Edges of hole chamfered and nut welded to casting as shown
1½", 12 Thd
1"-3/4 nut. Turn and thread 1½", 12 thread.
Cylinder body
Original stud hole

casting by the presence of water in the cylinder. When balanced slide valves alone were used, the complaint was not so common as at the present time. If the damage occurs at locations other than in the zone outside of the steam ports, the holes may sometimes be drilled larger, as well as deeper, and a stud with an enlarged end fitted to the cylinder. In case the damage occurs at the port, in order to avoid drilling through into the port to secure a satisfactory thread, it is sometimes the practice to build up the damaged zone by bronze welding. When, as sometimes happens, a countersunk-shaped break occurs, welding is not always successful, as the entire stress of the stud comes directly upon the weld instead of coming upon the casting proper.

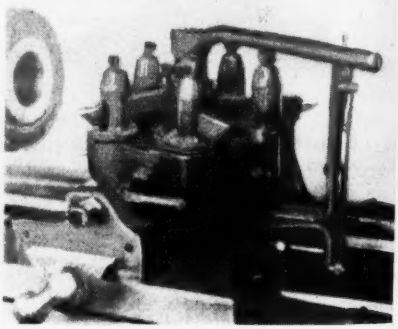
A repair method that appears to be successful is described and illustrated herewith. The damaged hole is enlarged, by using a flat-end drill, to something like 1½-inch 12-thread in order to apply a threaded bushing. As shown, it is assumed that the original stud is one inch in diameter. In this case, a one-inch nut, being approximately 1⅝ inches across flats, may be turned and threaded to some convenient size suitable for an available tap and yet leave sufficient thickness of wall to insure a secure fastening Larger or smaller studs are cared for by proportionate sizes.

Either the edge of the hole, the edge of the nut, or both, are slightly chamfered to allow welding the threaded bushing to the casting in order to prevent the nut backing out when necessary to remove the stud.

A "Home-made" Turret

By FRANK R. HYNES

THE photograph shows a turret that was made to use on an engine lathe, and as shown, also includes a new cross slide. This turret is made for use with chucking work only, and is made so that the tool that is in operation does not overhang, but is supported directly over the cross slide.



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of the carriage, making it possible to duplicate dimensions without measuring or calipering.

To operate, the long handle on the top of the turret is pushed toward the rear, which unlocks the head by loosening the nut on the top of the center spindle. As it continues further, the handle slides over the "flipper," which can be seen sticking up near the end of the handle, the flipper, in turn, operating a bell crank which draws the locking pin that holds the turret in position. Before the wrench handle slips off the "flipper," a dog attached to the lower end of the clamping nut on the center spindle comes in contact with a ratchet and starts the turret head moving, pushing it around until the locking pin finds the next hole in the bottom of the turret head. The locking pin is not drawn out on the return movement of the wrench. Thus one movement, over and back, changes the tools and locks the turret again.

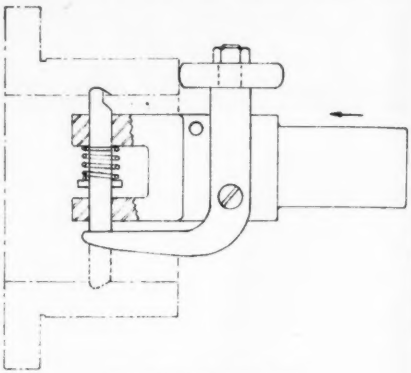
The parts that are made with the use of this turret head are made in several different sizes, although all are finished to the same proportions. Consequently to change sizes it is only necessary to change the screw in the stop block, changes in the tool setting being unnecessary. Other jobs are also done on this machine, for which a similar turret head is required, but instead of changing the tools, the clamping nut on top is taken off and the turret is exchanged for another in which the tools are all set up. The small shop that is doing a small manufacturing business with a limited amount of equipment would find this idea both practical and profitable.

Cutting Internal Grooves

By H. C. KLINE

THE common method of forming internal grooves for grinding relief is to use a tool in the cross slide, which is fed into the hole and then traversed.

It is, however, possible to make these grooves without using the cross feed by using a tool similar to the one shown in the illustration. This tool



Internal Grooving Tool

was designed to increase production and simplify the tool set-up on an automatic chucking machine.

The device consists of a holder with a hole broached in the end for the tool bit and an arm carrying a roller which rides on the face of the work. As the turret feeds forward this arm forces the tool bit outward to cut the desired depth. When the turret returns, a spring on the tool pushes the arm back to the small stop pin which is provided to limit its movement.

A grinding wheel that is out of balance will usually cause chatter marks on the work. Taking up the spindle bearings to eliminate the chatter is bad practice, as the bearings can easily be tightened too much and may be ruined. A wheel should never be put into a precision grinding machine without first being balanced.

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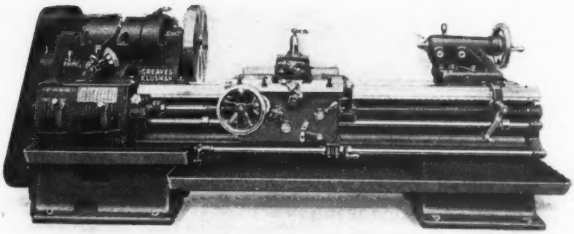

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MODERN Machine Shop

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By
DON G. GARDNER - - - - *Publisher*
HOWARD CAMPBELL - - - - *Editor*

"Intangible Effort"

THE article on page 12 of this issue, entitled "Intangible Effort Earns Salary Dividend," discusses the method developed by the head of one large company, whereby the executives who have been with the company a given length of time are enabled to capitalize on their experience, ability and loyalty to the firm. The particular value of the method as outlined seems to lie in the fact that each of the recipients knows that the amount of dividend he will receive will be based upon his value to the company, as indicated by the size of his salary, and that the rate of percentage upon which the dividend is based cannot be juggled at the last minute by some official who can see only the cost and not the profit.

That the "intangible effort" which is put forth by the employe who has demonstrated that he is capable and thoroughly interested in his work should be rewarded has been conceded by a large number of the country's industries, many of which have been paying "bonuses" of one kind or another for a number of years.

Every employer likes to see his men going about their work as though they owned substantial shares in the business; everyone knows that an apathetic organization can easily ruin a business, and that a loyal, hard-working crew can just as easily go over the top to success with it. Consequently it is an easy matter for the employer to announce that a bonus will be paid at the end of the season if the profits are big enough, hoping in this manner to develop the winning spirit among his men.

So far, so good; the trouble is that in many cases the employer is intentionally vague as to the size of the bonus, and the employe of average intelligence is not long in discovering both the fact and the reason.

The spirit which prompts an employe to say "we" instead of "they," when speaking of the firm, is a valuable asset and should be recognized accordingly, but the reward should be based upon some kind of system that is obvious to the recipient. The article mentioned should be of interest to the employer who is considering this problem.

No "Election Slump"

AT THE time of going to press, the election is still a few days away, but it is worthy of comment that the possible outcome of the election has had no effect on the business of the country. Factory employment and payrolls are showing large gains, as compared with this time last year. Production in the steel, automobile and various other leading industries is breaking all records, with a corresponding acceleration in the activities of accessory businesses.

In the face of such conditions, most of the doubts as to the future of business have vanished, and sentiment is riding on the crest of the wave. The "election year" ghost has finally been laid, thanks to the Federal Reserve Banking System. Gradually but surely the business of the firm of United States of America is becoming better organized and the difficulties which have interfered with its progress are being eliminated.

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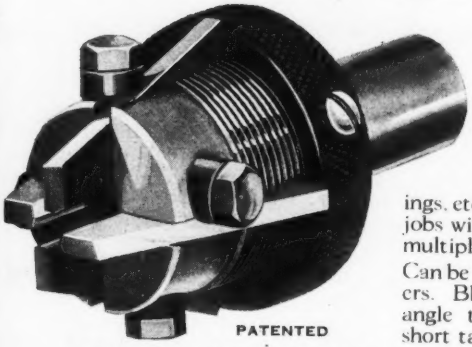

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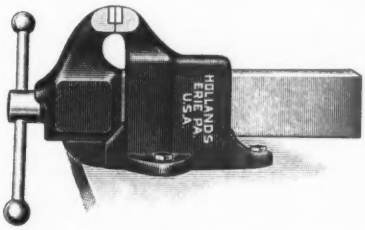

A line of individuality and merit, that is the result of over forty years of concentrated effort to produce Vises that will meet the most severe service demands.

Strength, rigidity and durability are the three qualifications that have been attained by good design, workmanship and manufacturing facilities.

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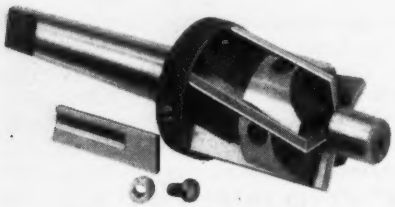
New Shop Equipment

Genesee Facing Tool

A new type of facing tool, known as the "style X," has been placed on the market by the Genesee Manufacturing Co., Inc., 141 North Water Street, Rochester, N. Y. The tool is similar in design to the other "Genesee" facing tools, with the exception that it is of sturdier construction and has more blades. The tool is intended for use in spot facing, finishing bevels, grooving, and forming. The body of the tool is of chrome nickel steel, hardened, and is supplied with either high speed or carbon steel blades, as required. The pilots are interchangeable. The feature of the tool is that the blades can be removed from the tool for grinding, making it unnecessary to remove the entire tool from the machine. An adjusting collar is provided for readjustment of the blades after grinding, so that the cutting edges are maintained always in the same relation to the shank and pilot.

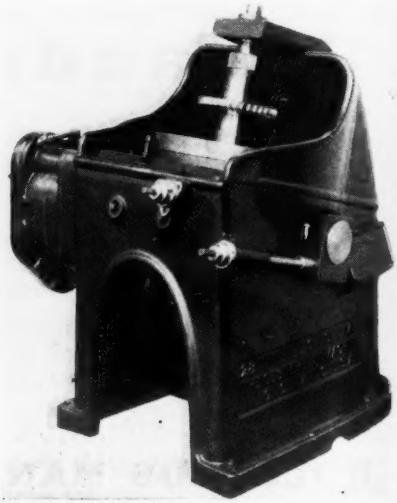


Genesee "Style X" Facing Tool.

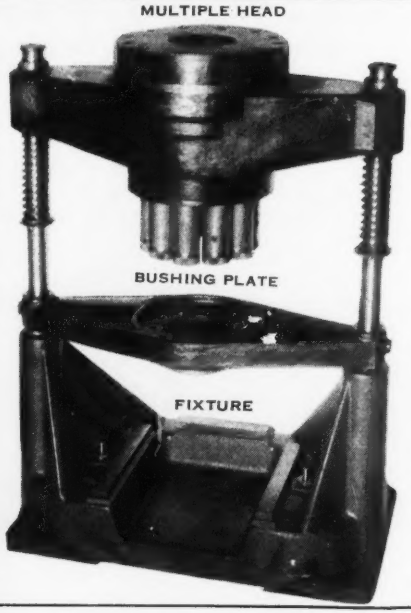
The blades are easily removed and replaced or readjusted; removing the pilot and loosening the clamp screws makes it possible to slip the blades out of their grooves without difficulty. In replacing, the blades and pilot are slipped into place and the blades are located against the pilot, where they are locked. The tool is furnished in sizes of from 1¼ inch diameter to 4 inches diameter. Extra blades can be furnished as required.

Oesterlein 28-Inch Tilted Offset Miller

The Oesterlein Machine Co., 3319 Colerain Avenue, Cincinnati, Ohio, has brought out a 28-inch tilted offset milling machine, shown in the illustration herewith. The design of the machine incorporates the same general principles of offset milling as are used in the 48-inch machine. Relatively large cutters, completely surrounded with



Oesterlein 28-Inch Tilted Offset Miller



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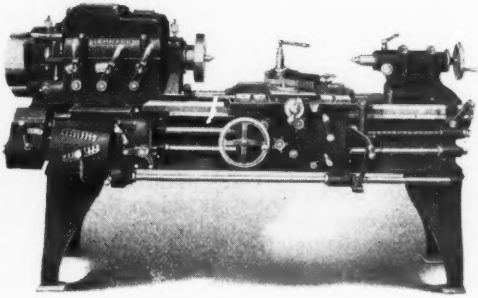
20/22"
22/24¼"
24/27⅛"



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work, the center of the cutter and center of the work circle being offset from each other to obtain the necessary depth of cut, form the basis around which the design of these machines has been developed.

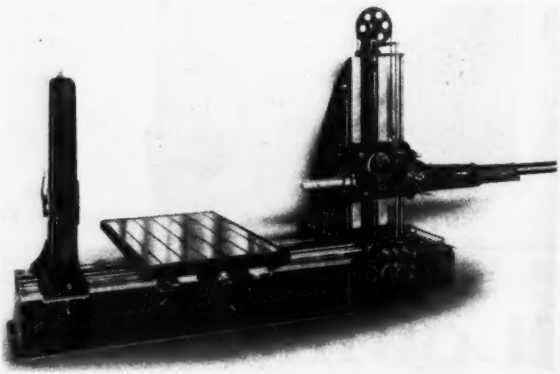
The cutting operation is continuous, a section of the work circle being at all times in contact with the cutter. The machine is intended for use on milling operations on screws and bolts, such as flatting the heads of connecting rod bolts, slotting screws, milling small clevises and yokes, also for sawing operations and straddle and face milling of small parts. Because the production on such work is limited only by the number of parts an operator can handle, means are provided in the work-holding fixtures for automatically clamping, unclamping and ejecting the parts, thereby leaving the operator's entire time for loading.

The features of the machine include provision for the use of twenty gallons of coolant per minute; a large chip basin within the base of the machine: frictionless bearings throughout, including the spindle bearings; heat-treated multiple splined gears and shafts throughout; a relatively care-free lubrication system, and adaptability to the use of automatic fixtures.

The machine has an 18-inch diameter table, swings 28 inches diameter, allows 14 inches from table to outboard bearing, uses a 2¾-inch diameter arbor, weighs 2,600 pounds net, and is driven by a 3 h. p. 1,800 r. p. m. motor mounted on the back of the machine, where it is connected by chain to the driving sprocket. The machine is designed for long life and heavy duty service.

G & L No. 50 Table-Type Horizontal Boring, Drilling and Milling Machine

The Giddings & Lewis Machine Tool Company, Fond du Lac, Wisconsin, has brought out a new table-type horizontal boring, drilling and milling machine in which increased range and capacity have been added to the features of precision and ease of handling. The bed of the machine is of massive box-type construction, weighing over 15,000 pounds, which is intended to provide proper distribution of weight in handling heavy work. The ways are 13 inches wide relieved at the center, and 48 inches over the outer edges. The G & L feature of bolting, tonguing and doweling the column to the bed unit has been employed in this machine, a large tongue being machined integral with the bed for this purpose. The column is a heavy box section well ribbed in both directions, the base being 40 inches square.



G & L No. 50 Horizontal Boring, Drilling and Milling Machine

The table and saddle unit is of the same general design as the G & L No. 45 machine, but considerably heavier. The table has been stiffened in every direction by a network of heavy ribbing. The screw for the table cross feed is mounted on ball bearings. The

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Designed to fit any type of drill press, a U. S. Drill Head converts any single spindle drill into a multiple unit quickly.

No time wasted making adjustments—spindles are fixed. Any number of holes, fifty if necessary, can be drilled as easily as one.

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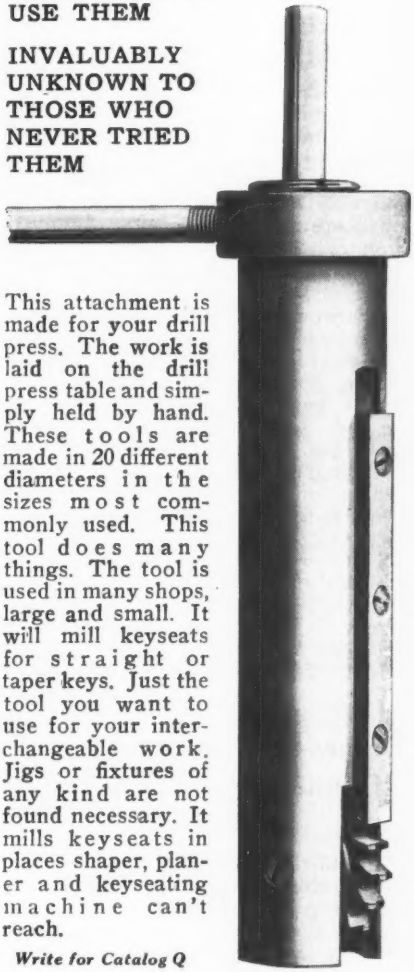


This attachment is made for your drill press. The work is laid on the drill press table and simply held by hand. These tools are made in 20 different diameters in the sizes most commonly used. This tool does many things. The tool is used in many shops, large and small. It will mill keyseats for straight or taper keys. Just the tool you want to use for your interchangeable work. Jigs or fixtures of any kind are not found necessary. It mills keyseats in places shaper, planer and keyseating machine can't reach.

Write for Catalog Q

NATIONAL MACHINE TOOL CO.

2271 Spring Grove Avenue

CINCINNATI, OHIO

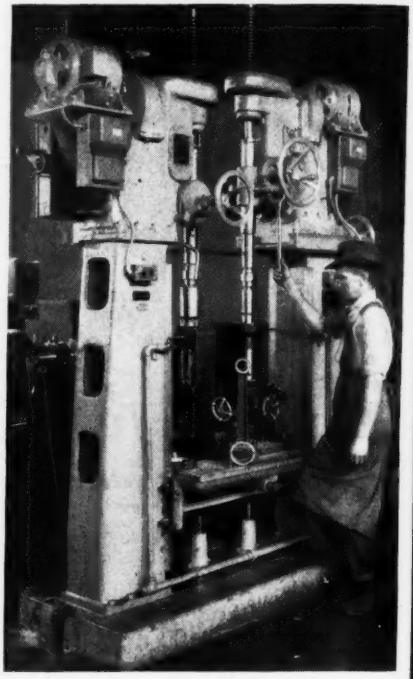
spindle head is of massive design and the main casting is entirely of one piece to provide rigidity.

Variations in speeds and feeds are obtained through sliding gears and jaw clutches in separate units, mounted on the bed of the machine and running in oil. All levers are easily accessible from the normal operating position. All gears are of hardened chrome nickel steel, and the bevel gears have the spiral tooth form, which provides for smooth, quiet operation. Gear-box shafts are mounted in ball bearings. The Bowen system of lubrication is standard equipment for oiling the ways, gears and bearings, and a pump in the head provides a constant flow of oil to all parts.

The power to the machine is supplied through two Twin Disc friction clutches, making the machine particularly adapted to tapping and adding to the sensitiveness of control. A change gear quadrant is included in the feed gear train so that positive leads can be had for tapping and threading. The spindle diameter is 5 inches; longitudinal travel of spindle, 64 inches; vertical adjustment of head on column, 64 inches; working surface of table, 60 x 96 inches; maximum dimension face of spindle to end support, 120 inches; range of spindle speeds, 5 to 245 r. p. m.; number of feeds per revolution of spindle, 18; net weight, 45,500 pounds.

Barnes Special Two-Spindle Connecting Rod Drilling Machine

The Barnes Drill Co., 801-851 Chestnut St., Rockford, Ill., has brought out the machine illustrated, which is especially designed for the drilling and reaming of connecting rods. The machine consists of two columns, bolted to a special base, each column supporting a head that carries a spindle with an individual motor, speed and feed gears, and other working parts. One head is bolted to the column, the other being gibbed to the column and provided with horizontal adjustment so



Barnes Special Two-Spindle Drilling Machine

that the distance between spindles can be varied to suit the work.

The machine is equipped with ball and roller bearings throughout, has spur-gear feeds, and is self-oiling. The pump for the self-oiling system is located in one of the heads and a coolant pump is located inside one of the columns at the base. Each spindle is provided with six splines, thus eliminating the use of keys, and revolves in roller bearings. Speeds are controlled through a set of heat treated alloy steel crown slip-gears, the gear-shafts being provided with radial ball bearings. Spur feed gears are used, which are also of alloy steel and heat treated. Power feeds may be engaged or disengaged while the spindle is

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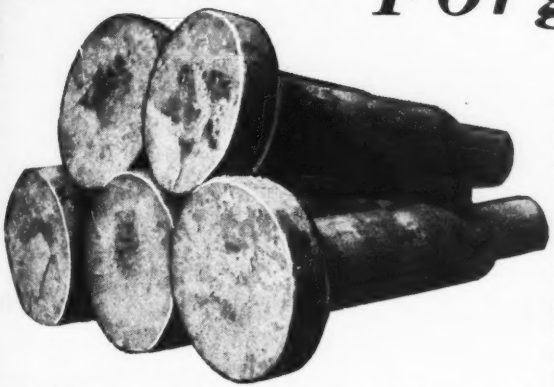

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running, and an automatic stop providing full spindle travel is provided.

Power for both spindles is controlled by a lever at the front of the machine as shown in the illustration. A special table for elevating is provided, and is mounted so as to obtain the maximum of rigidity. A safety device prevents overloading and damage to the spindles and cutting tools.

"Hisey" Portable Grinder

The illustration shows a ½-h. p. portable electric grinder which has been placed on the market by The Hisey-Wolf Machine Co., Colerain and Marshall Streets, Cincinnati, Ohio. The grinder is equipped with a ball bearing motor, new two-pole switch which is controlled from the grip handle, and Timken roller bearings on the grinding spindle. Motors are supplied to fit the current-condition of

"Hisey" ½-h. p. Portable Grinder

the user; for single phase service a commutating type repulsion-induction motor is standard, for two and three phase service a ruggedly-built squirrel-cage motor is used, and for direct current a compound-wound motor that is especially designed for the tool. The tool is supplied with a cast steel wheel guard which can be adjusted to any angle. The grinding wheels furnished are selected to suit the work.

Levolier Fixture Switch

The McGill Manufacturing Co., Valparaiso, Indiana, has announced an improvement in the design of the Levolier No. 61 Fixture Switch. The change is made after a period of trial under actual working conditions, and is intended to make the switch more adaptable to use for industrial lighting where the two most essential requirements are individual control of the units and reliable operation. The switch also saves on run of conduit from outlet to switch, as well as saving on the wall switch and labor of installation. All of the current-carrying parts are of heavier section, and the make-and-break is so designed that the arcing effect is minimized. The switch will take the initial surge of a cold 500-volt gas-filled Mazda lamp, and will stand up in continuous service over long periods of time. The actual size is 1⅜ x ⅞ inch —the smallest 6-ampere pull switch made—and is therefore ideal for shallow ceiling pans.

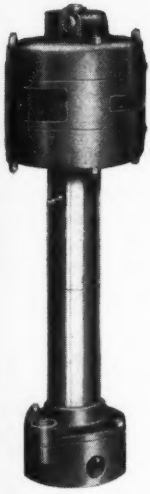
Levolier No. 61 Fixture Switch

"Logan" Catalog R-25

A complete line of air-operated devices that are adaptable to all types of production machines is described and illustrated in the new Catalog R-23, published by The Logansport Machine Co., Logansport, Ind. The catalog includes descriptions of air cylinders for use on work-holding devices, jigs, fixtures, vises, chucks, tail centers, work ejectors and other equipment, together with a complete line of air-operated chucks and a number of special air-operated tools. Each piece of "Logan" equipment is illustrated and a number of applications are shown. The book contains thirty-two 8½ x 11 pages.

Danly Die Makers' Supplies Catalog

Danly Die Makers' Supplies is the title of the fifth edition of the Danly Machine Specialties catalog. The new edition is greatly enlarged and includes two sections, the first consisting of a 12-page treatise describing how die sets, leader pins, bushings,



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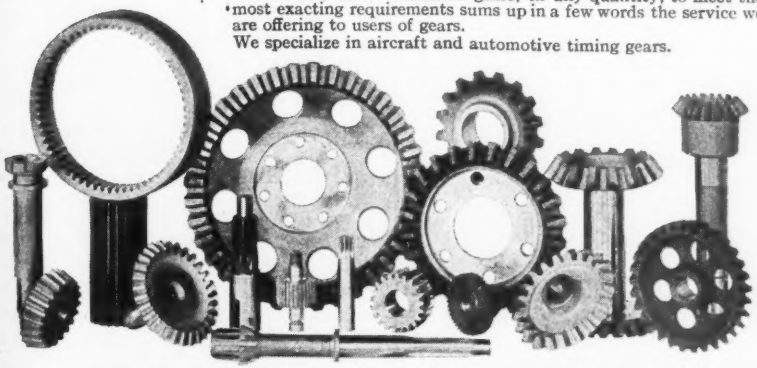

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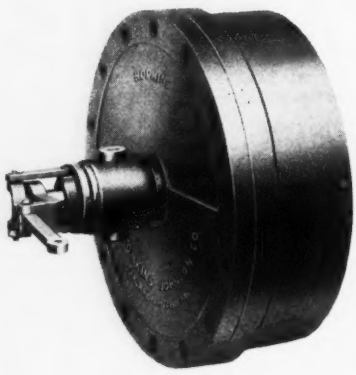

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and other die makers' supplies are made in the Danly Company's plant, the second section listing the various products made by this company, with illustrations, blue prints, and complete tables of dimensions, shipping weights, prices, and so on. The book contains valuable matter for every executive who is responsible for tooling up, production of stampings, or purchasing. A copy will be sent free on request. Address Danly Machine Specialties, Inc., 2104 South Fifty-second Avenue, Chicago, Ill.

McCrosky Catalog No. 11

Catalog No. 11, which has just been issued by the McCrosky Tool Corporation, Meadville, Pa., describes the complete line of tools and equipment made by this firm. The book includes descriptions and illustrations of McCrosky adjustable reamers, high speed chucking reamers, shell reamers, hand reamers, line reaming bars and sets, boring heads, Wizard chucks and collets, friction safety tap holders, round, square and hexagon tool turrets, self-centering steadyrests, "Neva-Stop" face plates, and lamp brackets for machines. A number of illustrations of installations of the various tools are included. The book contains sixty-four 6 x 9-inch pages.

Ex-Cell-O Standardized Jig Bushing Catalog No. D-28

A new catalog describing and illustrating the various types and sizes of standard drill jig bushings made by the Ex-Cell-O Tool & Manufacturing Co., 1200 Oakman Boulevard, Detroit, Mich., has been issued by that firm. The catalog gives complete information as to the uses and advantages of "ready-made" jig bushings, together with specifications and prices. Sent free on request.

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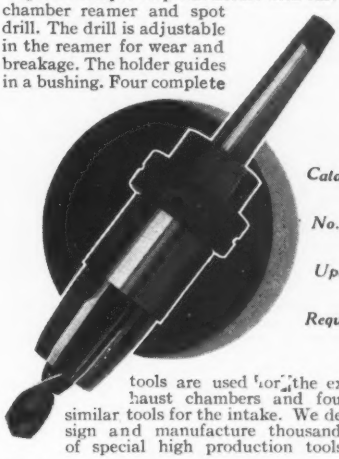

tools are used for the exhaust chambers and four similar tools for the intake. We design and manufacture thousands of special high production tools.

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Turret Lathes and Tools: Illustrated book describing Cincinnati Acme Turret Lathes and Screw Machines, and showing a variety of tools and fixtures for use with these machines. The Acme Machine Tool Co., 4955 Spring Grove Ave., Cincinnati, Ohio.

Scraping By Power: Bearing surfaces can now be scraped with a power scraper that is quicker and easier than the old-fashioned hand method. The tool is described in a folder that is issued by Anderson Bros. Mfg. Co., 1926 Kishwaukee St., Rockford, Ill. Sent free on request.

Machine Shop Accessories: Catalog B-27, issued by the Armstrong Bros. Tool Co., 328 N. Francisco Ave., Chicago, Ill., describes the line of tool holders, boring tools, wrenches, pipe tools, ratchet drills, lathe dogs, and other tools manufactured by this company.

Hobs and Milling Cutters: A complete line of milling cutters and hobs for cutting all kinds of gears, splines, sprockets and others forms is described in Catalog G. issued by the Barber-Colman Company, Rockford, Ill. Descriptions and illustrations of the Barber-Colman hobbing machine and hob-sharpening machines are included. Sent free on request.

All-Geared Drilling and Tapping Machines: A catalog describing in detail the various types of all-geared, self-oiling, drilling and tapping machines made by the Barnes Drill Co., 801-851 Chestnut Street, Rockford, Ill., will be sent free upon request.

Modern Drilling Equipment: Circulars describing the various types and sizes of Barnes upright drills, multiple drills, and horizontal drilling machines, has been issued by the W. F. & John Barnes Co., Rockford, Ill.

Bowsher Balancing Way: Gears, pulleys, fly-wheels, emery wheels, and other rotating parts should be properly balanced. This work can be done quickly and accurately on a balancing way that is described in a bulletin issued by The N. P. Bowsher Co., South Bend, Indiana.

"The Lathe With the Longer Life" is the title of a bulletin that describes the Coneless Lathes made by the Boye & Emmes Machine Tool Co., 2247 Spring Grove Ave., Cincinnati, Ohio.

Bradford Unit Type Drill Heads and Tapping Heads are described and illustrated in a bulletin published by the Bradford Machine Tool Co., 659 Evans Street, Cincinnati, Ohio. The bulletin also describes useful applications of these heads.

Bradford Precision Lathes: Precision Lathes for the tool room and for general manufacturing purposes, all-geared and cone types, belt or motor driven, are described and illustrated in a catalog that is issued by The Bradford Machine Tool Co., 657-671 Evans St., Cincinnati, Ohio. The catalog also includes descriptions of taper, relieving, turret and other lathe attachments. Sent free upon request.

Brent Buys Radial Drills: A story of the methods used by a plant executive to determine what type of machine is best suited to his purpose. Published by The Cincinnati Bickford Tool Co., Oakwood, Cincinnat, Ohio.

Gear Data: The Cincinnati Gear Co., Cincinnati, Ohio, has published Catalog D, which describes and illustrates the various type and kinds of gears made by this firm. The book contains photographs of the plant departments, with descriptions of the equipment employed, and also includes a number of pages of valuable data and reference tables for machine shop use.

Rapid Traverse Planers: Cincinnati Hypro Planers, made by the Cincinnati Planer Co., Cincinnati, Ohio, are described in a new catalog that has been issued by this company.

Shaper Progress: An illustrated catalog describing the various types of shapers made by the Cincinnati Shaper Co., Cincinnati, Ohio, and including descriptions of Cincinnati Shapers in use in different kinds of plants.

"The Lathe With the Pail" is the title of a catalog that has been published by the Cisco Machine Tool Co., 1765 Elmore St., Cincinnati, Ohio. The book describes the engine lathes, polishing lathes, and radial drill presses made by this firm.

Handbook For Drillers: The Cleveland Twist Drill Co., 1242 E. Forty-ninth St., Cleveland, Ohio, has published a book in which the various parts of the twist drill are described, and which tells how to grind a drill correctly. The troubles that result from incorrect grinding are described and illustrated and several chapters are devoted to the subjects of speeds, feeds, materials, cutting compounds, and so on.

Disc, Expansion and Compression Clutches: The various types of clutches and their uses are discussed in an illustrated booklet that is issued by The Conway Clutch Co., 1959 West Sixth Street, Cincinnati, Ohio.

Die Makers' Supplies: A complete line of die sets, leader pins, bushings, and other die makers' supplies are described in a book that is issued by the Danly Machine Specialties, Inc., 2104 South 52nd Avenue, Chicago, Ill. Sent free upon request.

Interchangeable High Production Tools: Catalog No. 28, issued free by the Eclipse Interchangeable Counterbore Co., 7410 St. Aubin St., Detroit, Michigan, describes and illustrates the intechangeable counterbores, spot facers, end form cutters, and other end cutting tools made by this firm.

Formica Silent Composition Gears: A booklet telling about the uses and advantages of Formica Silent Shock-Absorbing Gears, and containing a considerable amount of valuable data with rules and tables for laying out, cutting and using gears. Sent free by Formica Insulation Co., 4632 Spring Grove Avenue, Cincinnati, Ohio.

Fosdick Drills: This publication gives details as to the design and construction of Fosdick Radial, Upright, and Sensitive Drills. Published by the Fosdick Machine Tool Co., Cincinnati, Ohio.

Adjustable Blade Cutters: Hollow mills, facing tools, face mills, milling cutters and other production tools with adjustable, interchangeable blades are described and illustrated in a booklet that is issued free by the Genesee Manufacturing Co., 141 N. Water St., Rochester, N. Y.

Machinists' Tool Cases and Chests: The high grade tool cases and tool chests manufactured by H. Gerstner & Sons, 1254 Columbia St., Dayton, Ohio, are described in detail in catalog No. 27, which can be had by writing to this company.

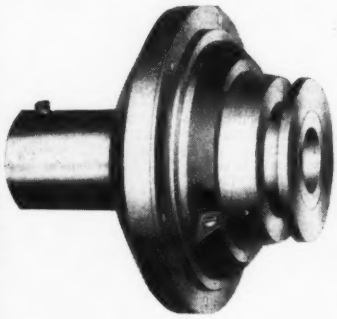
Greaves-Klusman Lathes: A book containing complete descriptions of the latest types of lathes made by this firm has been issued by the Greaves-Klusman Tool Co., Oakley, Cincinnati, Ohio.

Drilling and Grinding Electrically: Catalog M, showing and describing a variety of modern electric portable drills, grinders, and other tools, including floor grinders and buffers, has been issued by The Hisey-Wolf Machine Co., Colerain and Marshall Sts., Cincinnati, Ohio.

Vises and Pipe Tools: The bench, machine and pipe vises, pipe cutting and threading tools, babbitt ladles and melting pots made by the Hollands Manufacturing Co., Erie, Penna., are described and illustrated in a booklet that is issued free by the firm mentioned.

Modern Milling Equipment: A book describing and illustrating in detail all the parts of various types of milling machines and showing a number of ways of handling milling jobs will be sent free to the readers of this magazine by the Kearney & Trecker Corporation, Milwaukee, Wis.

Cutter and Tool Grinding: A book that tells how to



The Conway DISC CLUTCH

Is designed and built to control your machine.

To give it an easy engagement —instant release.

To insure its "business end" of all the power and capacity of its prime mover.

It is enclosed, balanced, has centripetal action, one point, rigid and accurate adjustment, chrome vanadium actuators, steel discs throughout.

There's so much to say about it, that it can't all be said here...

But in one clutch working under your conditions—the whole splendid story is eloquently expressed in capable performance.

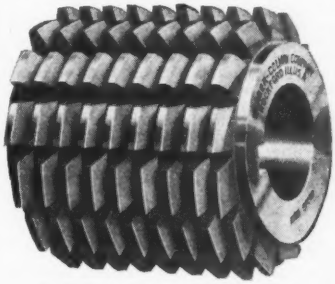
Order it and watch it work and you'll always want a Conway Clutch.

The Conway Clutch Co.

1959 W. 6th St., Cincinnati, Ohio

"Incorporate dependability into your product."

SERVICE *Is Our Motto* QUALITY *Our Creed*



GEAR HOBS *and* "BETTER CUTTERS"

by

BARBER-COLMAN *of* ROCKFORD

THESE Small Tools are built for long hours of steady use... to stand the battering of a heavy feed and emerge triumphant... to hew steadily to the limit line beneath a chattering mountain of chips... Quality to the core... strength and sturdiness ever dependable.

BARBER-COLMAN COMPANY

General Offices and Plant—Rockford, Ill., U. S. A.

grind tools and cutters accurately and which also describes and illustrates the different types of LeBlond Universal Tool Room Grinders will be sent free upon request. Address, The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio.

Lehmann Lathes: Details of the outstanding features of Lehmann Lathes are given in a catalog published by the Lehmann Machine Co., 3560 Chouteau Av., St. Louis, Mo.

Air-Operated Work-Holding Devices: A booklet showing how air-operated chucks and devices of various kinds can be applied to different kinds of machines to save time and labor has been issued by The Logansport Machine Co., Logansport, Ind.

Time-Saving Machine Equipment: How machining time can be reduced to the minimum by the use of Wizard chucks, collets and tap holders, turret tool posts, self-centering steadyrests, and other McCrosky equipment is told in a book that is issued by the McCrosky Tool Corporation, Meadville, Penna. Will be sent without charge.

Lamp Guards: The various types and kinds of lamp guards made by the McGill Manufacturing Co., Valparaiso, Ind., for factory use are described in a catalog that will be sent free upon request.

Modern Lathe Design: A bulletin describing and illustrating the features of the Monarch 16-speed Helical Geared Timkenized Lathe has been published by The Monarch Machine Tool Co., Sidney, Ohio.

Roller Bearing Radial Drills: The application of Timken roller bearings in the design of modern radial drilling machines is discussed in a bulletin describing "Mor"-Speed Radial Drills, published by the Morris Machine Tool Co., Cincinnati, Ohio.

An Outline of Economical Small Drilling: The subject of small-hole drilling is discussed in a booklet that is published by Adolph Muehlmatt, Fifth and Elm Sts., S. E., Cincinnati, Ohio. The booklet also describes the outstanding features in the construction of the A. M. Sensitive Drilling Machine.

"The 'Hole' Story in One Word" is the title of a publication that has been issued by The National Automatic Tool Co., Richmond, Ind. The book gives details as to construction and uses of "Natco" multiple drilling and tapping machines.

Milling Internal Keyways: A simple method of milling keyways in gears, wheel hubs, and other similar parts with the aid of a drill press and a special tool is explained in a booklet that is published by the National Machine Tool Co., 2271 Spring Grove Ave., Cincinnati, Ohio.

Grinding Wheel Information: A booklet which tells how grinding wheels are made and graded, and which gives instructions for mounting wheels, operating speeds for different kinds of work, instructions for truing and dressing, and other information has been issued by the Norton Company, Worcester, Mass. Sent free upon request.

"Tool Room Grinding" tells how to sharpen milling cutters and how to grind drills, taps, reamers, lathe and planer tools, and dies. A number of drawings and photographs are shown, showing how to hold the tools for grinding, and the kinds of chips that should be produced by properly-ground tools, etc. Published by Norton Co., Worcester, Mass.

Engine, Turret, and Gap Lathes are described in a series of bulletins that have been issued by The Rahn-Larmon Co., 2935 Spring Grove Ave., Cincinnati, Ohio.

Automatic Lubrication: Individually motor-driven pumps that keep the work flooded with lubricant are described in a booklet that has been published by the Ruthman Machinery Co., Front and Pike Sts., Cincinnati, Ohio.

Engineering and Manufacturing Service: A complete engineering and manufacturing service for manufacturers who are not equipped to handle all of their own designing, experimental, or production work is described, with illustrations of the equipment available, in a bulletin that is issued by The Steel Products Engineering Co., Springfield, Ohio.

Saving Time With Small Tools: A line of time-saving small tools, including "Use-Em-Up" drill sleeves, "Wear-Ever" chucks, collets, cutters, reamer and tap holders, counterbores, spotfacers, and other tools is described in Catalog 36, issued by Scully-Jones & Co., 1909 S. Rockwell St., Chicago, Ill.

"Chucks and Their Uses" is the name of a book which contains a full description of the different kinds of chucks and suggestions for the proper care of chucks, and tells how chucks should be fitted to lathes. It also contains a number of suggestions for general shop practice. Sent free upon application by The Skinner Chuck Co., New Britain, Conn.

Material-Handling by Modern Methods: Modern methods of storing and transporting materials in the shop are discussed in a bulletin which also describes the various types of lift trucks manufactured by The Stuebing Cowan Company, 320 East Court St., Cincinnati, Ohio. Sent free upon request.

Twentieth Century Balancing Tool: A practical, sensitive and inexpensive device for balancing pulleys, flywheels, and other round parts is described and illustrated in a bulletin that will be sent without charge by the Sundstrand Machine Tool Co., Rockford, Ill.

Chuck With Air: How time and labor can be saved by the use of air-operated chuck, cylinders, and other equipment is told in a book which describes "Hopkins" Air-Operated Equipment. Published by The Tomkins-Johnson Company, 620 N. Mechanic St., Jackson, Mich. Sent free upon request.

Multiple Drilling With a Single-Spindle Drill: Methods by which multiple drilling may be done on a single-spindle drill, using multiple spindle drill heads, are discussed in a bulletin that is issued by The United States Drill Head Co., 1954 Riverside Drive, Cincinnati.

Electrically-Driven Portable Tools: The "U. S." line of electric drills, die grinders, electric screw drivers, surface grinders, tool post grinders, and bench and floor grinders is described in Catalog No. 24, which has been published by The United States Electrical Tool Co., 2471 W. Sixth St., Cincinnati, Ohio.

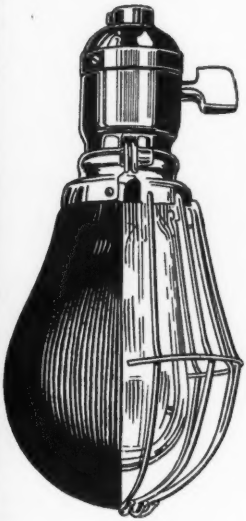
Shop Furniture: A catalog describing and illustrating all kinds of shop furniture, including benches, vises steel stands, foremen's desks, chip trucks, steel racks for bar stock, steel tote boxes, and other equipment will be sent free upon application to The Western Tool & Manufacturing Co., 1620 East Pleasant Street, Springfield, Ohio.

Hollow Bored Forgings and Steel Shafts

BORED STRAIGHT AND TRUE TO SIZE

You can be sure of prompt delivery, fair prices and high quality when you order forgings for piston rods, clutch shafts, lathe spindles, rams, hydraulic cylinders, etc., from us. Send prints for estimate.

AMERICAN HOLLOW BORING CO., 1035 W. 19th St., Erie, Penna.



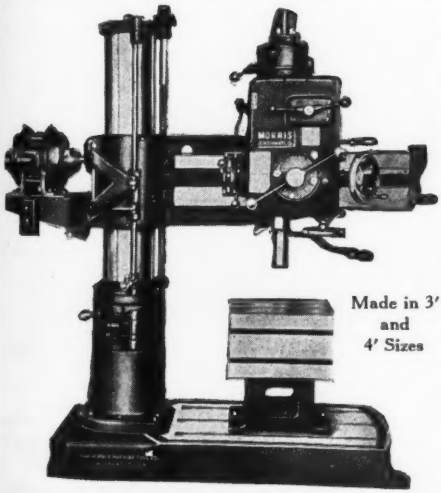
Shield the Light— and Protect the Lamp

It doesn't take long to blind a workman with unshielded lights. The constant glare not only reduces the efficiency of the man, but tends to slow up production. McGill Reflector Guards direct the light where it is most needed and take away the glare that causes eye strain and personal injuries. In addition, the guards protect the lamp from breakage and prevent removal by any but authorized persons.

Carried In Stock By All Jobbers

McGill Manufacturing Co.
Valparaiso, Indiana

"MOR-SPEED"—Named for a Purpose



Made in 3′ and 4′ Sizes

Morris Mor-Speed Radials are so named to drive home the fact that they are powerful, efficient, *fast!* They are production machines and are built to give service.

Timken Roller Bearings; all geared drive with hardened gears—six broached keyways; heat treated shafts, multiple splined; multiple disc clutch; forced feed lubrication; all speed and feed changes in the head; single lever elevating and clamping—just a few of the features that "make" Mor-Speed Drills. Spindle speeds from 100 to 1600 R.P.M.; capacity to 1½″ drills; sizes 3′ and 4′.

Send for complete details.

THE MORRIS MACHINE TOOL CO.
CINCINNATI, OHIO, U. S. A.

Check For Information Wanted

If you are interested in prices or information on any of the equipment listed, check the item, write your name, firm name, title and address on the margin, tear out the page and send it to Modern Machine Shop, 128 Opera Place, Cincinnati, Ohio. We will see that you are supplied with the information desired.

- ☐ Abrasive Discs
- ☐ Abrasive Polishing Grains
- ☐ Arbors
- ☐ Babbitt Metal
- ☐ Balancing Machines
- ☐ Balancing Ways
- ☐ Bearings, Ball or Roller
- ☐ Bearings, Die-cast
- ☐ Bearings, Bronze & Bab't
- ☐ Belting, Leather
- ☐ Belt Dressing
- ☐ Bench Legs
- ☐ Benches
- ☐ Bending Machines
- ☐ Blue Printing Machinery
- ☐ Bolt and Nut Machinery
- ☐ Bolts and Nuts
- ☐ Bolts, Stripper
- ☐ Boring Bars
- ☐ Boring Mills, Vertical
- ☐ Boring Mills, Horizontal
- ☐ Boring Heads
- ☐ Boring Tools
- ☐ Broaches
- ☐ Broaching Machines
- ☐ Bushings, Jig
- ☐ Bushings, Bearing
- ☐ Cabinets, Steel, Shop
- ☐ Calipers
- ☐ Centering Machines
- ☐ Centers, Lathe
- ☐ Chains, Sprocket
- ☐ Chamfering Machines
- ☐ Chucking Machines
- ☐ Chucks, Air-Operated
- ☐ Chucks, Quick-Changing
- ☐ Chucks, Collet
- ☐ Chucks, Drill and Tap
- ☐ Chucks, Lathe and Planer
- ☐ Clamps, Machinists'
- ☐ Clutches, Friction
- ☐ Collars, Spacing
- ☐ Compounds, Carbonizing
- ☐ Compounds, Cutting
- ☐ Compressors, Air and Gas
- ☐ Contract Work
- ☐ Counterbores
- ☐ Countersinks
- ☐ Couplings, Flexible
- ☐ Cutters, Gear
- ☐ Cutters, Keyseating
- ☐ Cutters, Milling
- ☐ Cutting-Off Machines
- ☐ Cutting-Off Tools
- ☐ Dies, Self-Opening
- ☐ Dies, Threading
- ☐ Die Sets
- ☐ Die Shoes
- ☐ Dividing Heads
- ☐ Dogs, Lathe
- ☐ Dowel Pins
- ☐ Dressers, Grinding Wheel
- ☐ Drill Holders
- ☐ Drilling Machines, Bench
- ☐ Drilling Machines, Sensitive
- ☐ Drilling Machine Heads
- ☐ Drilling Mach., Automatic
- ☐ Drilling Machines, Gang
- ☐ Drilling Mach., Heavy Duty
- ☐ Drilling Machines, Multiple
- ☐ Drilling Machines, Radial
- ☐ Drills, Center
- ☐ Drills, Portable Electric
- ☐ Drills, Portable Pneumatic
- ☐ Drills, Ratchet
- ☐ Drills, Twist and Flat
- ☐ Files and Rasps
- ☐ Filing Machines
- ☐ Forging Machinery
- ☐ Furnaces, Forging
- ☐ Furnaces, Heat Treating
- ☐ Furniture, Machine Shop
- ☐ Gauge Blocks
- ☐ Gauges, Dial
- ☐ Gauges, Plug and Ring
- ☐ Gauges, Thread
- ☐ Gear Blanks, Composition
- ☐ Gear-Cutting Machinery
- ☐ Gears, Cast or Cut
- ☐ Grinding Mach., Cylindrical
- ☐ Grinding Machines, Univ.
- ☐ Grinding Machines, Cutter
- ☐ Grinding Machines, Drill
- ☐ Grinding Machines, Internal
- ☐ Grinding Machines, Portable
- ☐ Grinding Machines, Surface
- ☐ Grinding Wheels
- ☐ Grinding Wheel Stands
- ☐ Hammers, Pneumatic
- ☐ Hobbing Machines
- ☐ Hobs, Gear
- ☐ Hoists, Chain or Electric
- ☐ Indicators, Speed or Test
- ☐ Jacks, Planer
- ☐ Keyseating Machinery
- ☐ Lapping Machines
- ☐ Lathes, Engine
- ☐ Lathes, Turret
- ☐ Lathes, Automatic
- ☐ Lathes, Bench
- ☐ Lathes, Gap
- ☐ Lathes, Polishing
- ☐ Lathe Dogs
- ☐ Lubricants
- ☐ Mandrels, Expanding
- ☐ Mandrels, Solid
- ☐ Micrometers
- ☐ Milling Machines, Automatic
- ☐ Milling Machines, Bench
- ☐ Milling Machines, Horizontal
- ☐ Milling Machines, Vertical
- ☐ Milling Attachments
- ☐ Milling Tools
- ☐ Oil-Grooving Machines
- ☐ Oil Stones
- ☐ Oils
- ☐ Ovens, Industrial
- ☐ Parallels
- ☐ Pipe-Cut'g & Th'd'g Mach'y
- ☐ Pipe Tools
- ☐ Planers
- ☐ Polishing & Buffing Machs.
- ☐ Presses, Arbor
- ☐ Presses, Punch
- ☐ Pulleys, Metal or Wood
- ☐ Pumps, Lubricant or Oil
- ☐ Punches, Hand
- ☐ Punches, Power
- ☐ Punch Holders
- ☐ Racks, Cut
- ☐ Reamer Holders
- ☐ Reamers, Adjustable
- ☐ Reamers, Solid
- ☐ Riveting Machines
- ☐ Rules, Steel and Wood
- ☐ Rust Preventatives
- ☐ Saws, Metal
- ☐ Saw Frames and Blades
- ☐ Sawing Machines, Power
- ☐ Saws, Band
- ☐ Saws, Milling
- ☐ Scales, Machinists'
- ☐ Screw Machines, Automatic
- ☐ Screw Machines, Hand
- ☐ Screws, Cap, Set or Mach.
- ☐ Shafting
- ☐ Shafts, Flexible
- ☐ Shapers
- ☐ Shears, Hand or Power
- ☐ Sleeves, Drill
- ☐ Springs, Pressure Pad
- ☐ Squares
- ☐ Stamps, Steel
- ☐ Stands, Shop, Portable
- ☐ Tap Holders
- ☐ Tapes, Measuring
- ☐ Tapping Machines
- ☐ Tapping Attachments
- ☐ Taps and Dies
- ☐ Taps, Collapsible
- ☐ Testing Mach'y, Hardness
- ☐ Thread-Cutting Tools
- ☐ Threading Machines
- ☐ Thread Mill. & Roll. Mach'y
- ☐ Tool Bits
- ☐ Tool Cases
- ☐ Tool Holders
- ☐ Tool Posts, Lathe
- ☐ Trolleys and Tramways
- ☐ Trucks, Hand, Lift, Power
- ☐ Turrets, Tool Post
- ☐ Valves, Air Control
- ☐ Vises, Bench or Machine
- ☐ Welding Equip. & Supplies
- ☐ Welding Machines, Electric
- ☐ Wrenches, Drop-Forged
- ☐ Wrenches, Pipe
- ☐ Wrenches, Ratchet
- ☐ Wrenches, Tap

PHONOGRAPH MOTOR BUSINESS FOR SALE

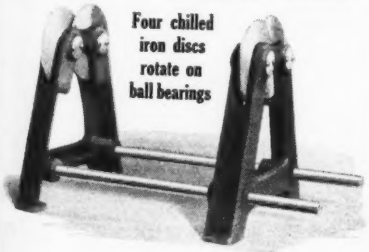
GROWING business, including machinery, tools, jigs, dies, patterns, raw material, parts in process and finished stock, for the manufacture of up-to-date phonograph motors. This is an unusual opportunity for someone to establish himself in a lucrative business, with a small outlay of capital. Inventory includes many finished motors and parts which will, in a short time, reimburse purchaser for large percentage of purchase price. Other growing manufacturing interests demand possession of space now occupied by this business, and it is for this reason that we are willing to sacrifice on same. If you are interested in the manufacture of a product that will bring quick returns and a good profit, address—**Box 49, care** MODERN MACHINE SHOP.

Anderson Improved
Balancing Ways
No Leveling Required

A simple and excellent device for balancing, straightening and trueing.

They are made in the following sizes:

Swing	Greatest Distance Between Standards	Capacity in Lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000



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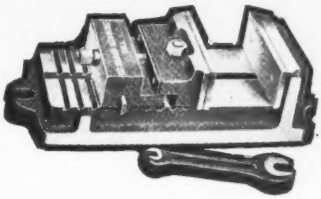
Mfd. By **Anderson Bros. Mfg. Co.**
1926 Kishwaukee Street, Rockford, Ill.

SKINNER DRILL PRESS VISES



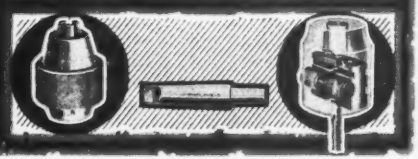
The Handy Tool
FOR
MACHINE SHOPS

Made In Five Sturdy Sizes

Holds straight or taper work while drilling in two directions.

Ask for Catalog of Complete Line

THE
SKINNER CHUCK CO.
New Britain, Conn.



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GEARS

All Kinds—Small—In Stock

The most accurate made and prices reasonable. We carry a complete line of gears in stock for immediate shipment. Can also quote on special gears of all kinds. Send us your inquiries.

Write for Catalog 80

CHICAGO STOCK GEAR WORKS
105-9 S. Jefferson St. Chicago, Ill.

GERSTNER TOOL CHESTS!

For Efficiency, for Economy.

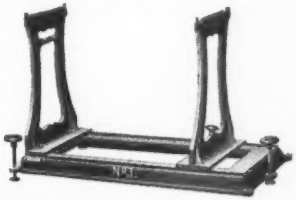
Save time, save tools, by using one of these good chests. Many sizes in a dozen styles.

Catalog free.

H. GERSTNER & SONS
1259 Columbia Street Dayton, Ohio

For Sure Balance—

an absolutely level and solid "Way" is necessary



BOWSHER "Balancing Ways"

are brought to an absolute *level* in ten seconds. No revolving parts.

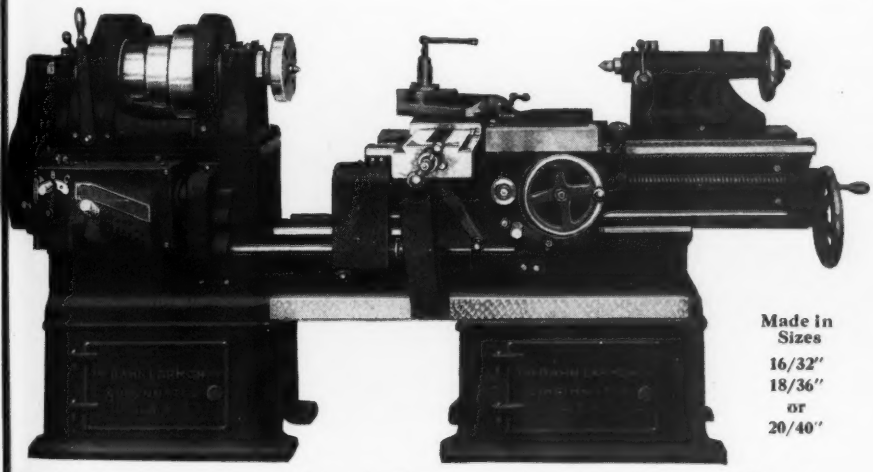
The edges or "knives" upon which the work is tested are ground *true*, and are mounted upon the planed "ways" of a heavy bed or frame.

Standards adjustable to suit length of arbor.

Three sizes for floor—one for bench use

Send for Catalog "H"

The N. P. Bowsher Co., South Bend, Ind.



Made in Sizes
16/32"
18/36"
or
20/40"

Rahn-Larmon 18/36" Extension Bed Gap Lathe

A lathe for large or small swing work, ready at all times. Requires no extra rigging up. Takes different distances between centers.

Belt driven or with nine speed all geared motor driven head. Tell us what your requirements are and let us quote you.

THE RAHN-LARMON CO. 2935 Spring Grove Ave., Cincinnati, Ohio

Riff-Raff Ravings

By GEO. ALEXANDER MANN
Raver-in-Chief

Paw's a Coffee Wader

Another bran' new shirt
Of Paw's Maw's junked—
Didn't roll his sleeves
Before he dunked.

* * *

We don't mind the canned eats so much—if Friend Wife would only stick to the can opener an' let our safety razor alone.

* * *

When you "hook up" with the Spirit of Youth, Father Time seems to forget to hand you wrinkles.

* * *

Aw, Hush!

We say to Hull with saxophones,
It's jes the way we feel;
We don't know why, unless it is
We have no "sax" appeal.

* * *

Time spent in worrying about competitors never gets you anywhere. "Service plus," given with cheerfulness, is a mighty good plan to copyright.

* * *

Tha's Tha Helluvut

For ev'ry ounce o' political difference there's a ton o' political indifference.

* * *

No matter how the land lies, it's got nothing on the real estate agent.

When Duty calls, a lot of folks suddenly become hard of hearing.

* * *

Many who say they hate religion in politics are referring to somebody else's religion.

* * *

Ain't Ut Hull?

No matter who you try to get,
The phone girl sets you dizzy;
Today I asked her for the zoo,
She said the "lion" is busy.

* * *

Many a thoughtless merchant uses his waste basket as a depository for sales ideas, and then laments about handicaps of modern business!

* * *

Poor Sandy

Once there was a Scotchman,
His name was Sandy Keck,
Took in a three-ringed circus,
An' died o' broken neck.

* * *

Another thing needed these days are key rings that'll carry the key holes as well as the keys.

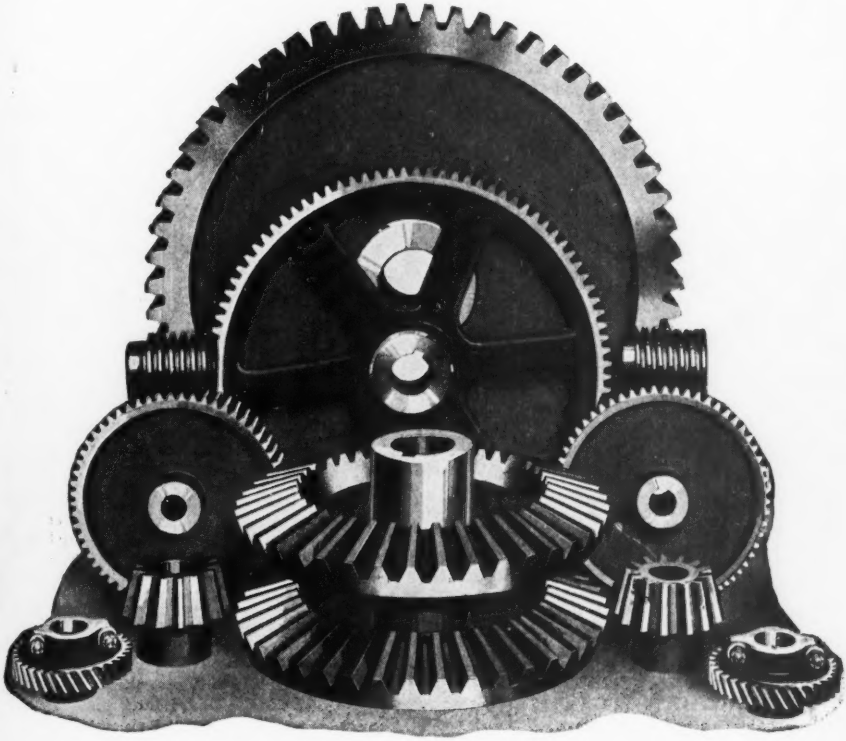
* * *

Not a Bad Suggest

The best way we know of to get ev'rybody to the polls is to slip across an amendment declaring it illegal to vote an' then turn the ballots over to the bootleggers.

GEARS

GOOD GEARS ONLY!



Gears of Every Description

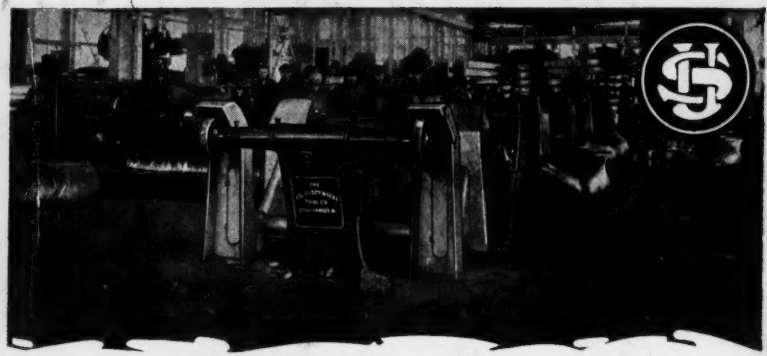
ACCURACY :: QUICK SERVICE

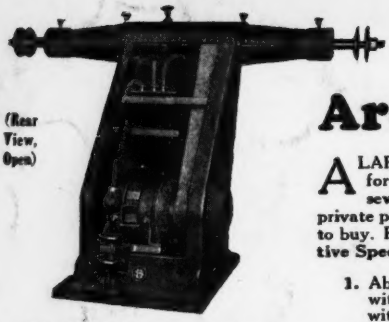
Write For Catalog

THE CINCINNATI GEAR CO.

CINCINNATI, OHIO

THE STANDARD OF QUALITY
SINCE 1897





(Rear View, Open)

U. S. Heavy Duty Selective Speed Buffer and Polisher

Made in 3, 5, 7½, 10 and 15 H. P. sizes, single or double spindles. Ball bearing motor in base, belted to one-piece nickel steel spindle supported by four heavy duty SKF Ball Bearings. Push button control, with no voltage release and overload protection. Dust-tight, etc., etc.

RECORDS Are Best Proof!

A LARGE, well-known firm was in the market for fifty-one buffing machines. One each of seven makes was put through a series of private performance tests to determine which make to buy. Records of these tests proved U. S. Selective Speed Buffers superior on seven points:

1. Ability to maintain speed under given load with minimum current requirements and without excessive reduction in speed.
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